AD-A011 134

EVALUATION OF EXISTING STRUCTURES

C. K. Wiehle

Stanford Research Institute

Prepared for:

Defense Civil Preparedness Agency

December 1974

DISTRIBUTED BY:



181074

Final Report

December 1974

O V EVALUATION OF EXISTING STRUCTURES

CONTRACT DAHC20-71-C-0292 DCPA Work Unit 11541

Approved for public release and sale; distribution unlimited.

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
US Decarries of Commerce
Spengfield, VA 22151

 ji_{k}

STANFORD RESEARCH INSTITUTE Menlo Park, California 94025 · U.S.A.



UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATIO	READ INSTRUCTIONS BEFORE COMPLETING FORM								
1 REPORT NUMBER	3. RECIPIENT'S CATALO	OG NUMBER							
(none)		123 P\$11	134						
4. TITLE (and Subtitle)		5. TYPE OF REPORT &	PERIOD COVERED						
EVALUATION OF EXISTING STRUCTURES	Final Report								
	!	6 PERFORMING ORG. I	REPORT NUMBER						
7 AUTHOR(s)		S CONTRACT OR CRAI	*** AU 1440 E D(s)						
C. K. Wiehle		8 CONTRACT OR GRANT NUMBER(s)							
O. R. Wienic	!	DAHC20-71-C-0292							
	,								
9. PERFORMING ORGANIZATION NAME AND ADDR	RESS	10 PROGRAM ELEMEN' AREA & WORK UNI	T, PROJECT, TASK						
Stanford Research Institute	1								
Facilities and Housing Research De	epartment	DCPA Work Unit	. 11541						
11. CONTROLLING OFFICE NAME AND ADDRESS		12 REPORT DATE	13. NO. OF PAGES						
Defense Civil Preparedness Agency	1	December 1974	125						
•		15. SECURITY CLASS, (of this report)							
Washington, D.C. 20301		Unclassified							
14 MONITORING AGENCY NAME & ADDRESS (if d	Jiff, from Controlling Office)	Unclassified							
	-	15a. DECLASSIFICATION							
		SCHEDULE	V/DOWNGRADING						
16. DISTRIBUTION STATEMENT (of this report)									

Approved for public release and sale; distribution unlimited.

17 DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from report)

18 SUPPLEMENTARY NOTES

PRICES SUBJECT TO CHANGE

19 KEY WORDS (Continue on reverse side if necessary and identify by block number)

Structures Blast

Wall and Floor Analysis

Dynamic Analysis

20. ARSTRACT (Continue on reverse side if necessary and identify by block number)

The objective of the overall research program is to develop an evaluation procedure applicable to existing NSS-type structures and private homes. Past efforts have been concerned with examining exterior walls; window glass; steel frame connections; applications to actual buildings; reinforced concrete floor systems, including restrained slabs; wood-joist floors; and the dynamic inelastic analysis ... building. Since this is the final report in this effort, a summary of the evaluation procedure for existing structures is presented in the

DD 1 FORM 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

UNCLASSIFIED

CECHBITY	CLASSIFICATION C	NE THIS BAGE (WA	o Data Estated
SECURIT.	CEMBBILLOW LICH C	TE THIS FACE INNI	III WALA CHILDIAN

19. KEY WORDS (Continued)

20 ABSTRACT (Continued)

report. Also included is the flow chart developed for a computer program to analyze a building subsystem; i.e., the dynamic response and collapse of all exterior and interior walls on one floor level of a building. An analysis made to determine the blast resistance of basement walls of Emergency Operating Centers is presented. Finally, the report contains a complete listing of all computer programs developed during the project for analyzing the dynamic response and collapse of wall and floor elements.

SUMMARY

Introduction

The objective of this investigation was to develop an evaluation procedure for determining the blast protection afforded by existing NSS-type structures and private residences. The procedure developed consists basically of (1) a method for determining the air blast loading on the structure and structural elements, (2) a method for determining the dynamic structural response up to collapse, and (3) a method for establishing the failure criterion for each structural member of interest. The analytical method used was to establish the resistance function for each wall or floor element by considering the approximate response mode and by assuming that the element was subjected to a uniformly distributed static load. The member was then transformed into an equivalent single-degree-of-freedom dynamic system, and the equation of motion solved on a computer using a numerical integration procedure.

Background

HARRING TO THE PROPERTY OF THE

The primary interest from the inception of this study has been the development of an evaluation procedure for analyzing the dynamic response and collapse of the building system. However, the complexity of a comprehensive evaluation procedure for a building system necessitated that important building elements be treated first. Therefore, the initial effort in the program was directed primarily toward the development of mathematical models to analyze the dynamic response and collapse of various types of one-way action walls. Also, the behavior of window glass and steel-frame connections were examined as part of the initial study.

The analytical procedures were then extended to include two-way walls, and a probability approach was incorporated into the evaluation procedure. Next, mathematical models were developed to analyze dynamically loaded reinforced concrete floor systems of various types, and wood-joist floors. During the conduct of the research program, the evaluation procedure has been used to predict the collapse overpressure of a large number of exterior walls and floors over basement areas for existing NSS buildings. As part of this effort, the relative collapse strength of the exterior walls and frame of a multistory steel-frame building was examined.

との国際などのできた。

A summary of the evaluation procedure for existing structures is contained in this final report. Also included is a flow chart for a computer program to analyze a building subsystem, and an analysis of the blast resistance of basement walls located in areaways of Emergency Operating Centers (EOCs). An appendix of the report contains a complete listing of all computer programs developed during the study to analyze dynamically loaded wall and floor elements.

Discussion

The second of the contract of

The computer programs for the evaluation of existing structures were developed as individual programs to analyze various types of wall and floor elements. Although this approach permitted the analysis of actual structures to be made sooner than would otherwise be possible, as well as being convenient for correlation of analytical models with experimental data, there was a need to develop a computer program to analyze the building system. As the next logical step in the development of an overall building program, a flow chart was developed for a building subsystem. The subsystem selected was all exterior and interior walls on one floor of a building. The report presents the flow chart for a computer program to analyze each wall on a room-by-room basis as the blast wave moves through the building.

The collapse strength of reinforced concrete basement walls was examined to determine the feasibility of retrofitting EOCs with doors to resist the 10-psi blast overpressure level. Although mathematical models have been developed for walls with window openings, the evaluation procedures were not extended to include walls with door openings. Since there was insufficient time to develop a generalized model for calculating the resistance and response of the wall configuration of interest, the following three-phase approach was used:

- (1) A detailed yield-line analysis of several specific reinforced concrete walls with door openings was made to establish the static resistance over a limited range of wall widths.
- (2) The computer program for analyzing the collapse of wall elements, developed by SRI for DCPA, was used to calculate the resistance of walls without door openings. The results were then compared with those obtained from the yield-line analysis for walls with door openings to determine the feasibility of using the existing computer program to simulate the dynamic response of walls with door openings. If the resistances for the two wall types was found to be not comparable, then it would be necessary to hand calculate a resistance function for each wall case.
- (3) An existing finite element computer program was used to analyze the static behavior for a few cases of walls with door openings to determine if shear or stress concentrations could conceivably produce a wall failure not predictable by the other analyses.

The various analyses led to a few general conclusions concerning the collapse of blast loaded reinforced concrete basement walls with dorropenings and located in areaways. First, for reinforced concrete walls 8-in. thick or thicker, and not over 10-ft high, it is probable that the wall strength of the weakest code-designed wall is sufficient to resist

a 10-psi blast loading if the horizontal distance from the edge of the door opening to the areaway support wall is less than coproximately 20 in. ($L_{\rm H}$ = 84 in.).

Second, for 8-in.-thick walls with horizontal distance between door opening and areaway wall greater than 20 in., it will be necessary temperature the wall in the vicinity of the door opening so as to upgrade the wall to the 10-psi blast overpressure level.

SECTED FOR AN EXPERIMENTAL PROPERTY OF A PROPERTY OF A SECTION OF A SE

Third, for reinforced concrete basement walls 12-in thick or thicker, the blast strength can be expected to be approximately equal to or greater than the 10-psi blast overpressure criterion for all wall conditions.

Final Report

December 1974

EVALUATION OF EXISTING STRUCTURES

By: C. K. W.EHLE
Facilities and Housing Research

Prepared for:

CIVIL DEFENSE PREPAREDNESS AGENCY WASHINGTON, D.C. 20301

CONTRACT DAHC20-71-C-0292 DCPA Work Unit 11541

SRI Project 1219-2

DCPA REVIEW NOTICE:

This report has been reviewed in the Civil Defense Preparedness Agency and approved for publication Approval does not signify that the contents necessarily reflect the views and policies of the Civil Defense Preparedness Agency.

Approved for public release and sale; distribution unlimited,

ABSTRACT

The objective of the overall research program is to develop an syaluation procedure applicable to existing NSS-type structures and private homes. Paul efforts have been concerned with examining exterior walks; window glass; steel frame connections; applications to actual buildings; reinforced concrete floor systems, including restrained sh. w. wood-joist floors; and the dynamic inelastic analysis of a steel frame building. Since this is the final report in this effort, a summary of the evaluation procedure for existing structures is presented in the report. Also included is the flow chart developed for a computer program to analyze a building subsystem; i.e., the dynamic response and collapse of all exterior and interior walls on one floor level of a building. An analysis made to determine the blast resistance of basement walls of Emergency Operating Centers is presented. Finally, the report contains a complete listing of all computer programs developed during the project for analyzing the dynamic response and collapse of wall and floor elements.

CONTENTS

SUMMA	NRY	•	•		•	•	•	•	•	•	•	S-1
ABSTI	RACT	•			•	•	•		•	•		iii
LIST	OF ILLUSTRATIONS	•	•		•	•	•	•	•	•	•	vii
LIST	OF TABLE	•	•		•	•		•	•	•	•	ix
I	INTRODUCTION					•	•	•		•	•	1
	Background											1
	Report Organization											3
	Acknowledgements											3
11	EVALUATION OF EXISTING STRUCTURES .	•	•		•		•	•	•	•		5
	Approach											3
	Wall and Floor Evaluation Procedure											5
	Introduction											5
	Wall Analysis											7
	Floor System Analysis											7
	Probability Considerations											8
	Air Blast Loading											9
	Applications											11
	Walls	•	•				•				•	12
	Floors		•				•	•			·	1.1
	Frame Analysis	•	•			•	•	•	•	•	•	1.4
	Building System Computer Program	•	•	• •	•	•	•	•	•	•	•	19
111	BUILDING SYSTEM PROGRAM	•	•		•	•	•	•	٠	•	•	21
ıv	ANALYSIS OF BASEMENT WALLS	•	•			•	•	•	•		•	27
	Approach				•							27
	Wall Design											28
	Analysis											31
	Wall With Door Opening											33
	Wall Without Door Opening											35
	Finite Elerent Wall Program											42

IV	ANALYSIS	oF .	BASEM	ENT	· WA	LL	s (cor	ıti	nue	d)											
	One-Wa	ıy Re	infor	ced	Co	nc	ret	e V	Wal	1 (Wi	the	out	t A	۱ro	hi	nį	g)	•	•	•	48
	One-Wa	y Co	ncret	e W	/a11	. (1	Wit	h A	lrc	hin	g)	•		•	•	•	•	•	•	•	•	49
	Summary	and	Discu	ssi	on	•		•	•		•	•		•	•	•		•	•	•	•	50
	Conclusi	ons	• •		•	•	• •	•	•		•	•	•	•	•	•	•	•	•	•	•	53
APPI	ENDIX A:	LIST	INGS	O I .	со	MPU	TER	P	ROC	GRA!	us	•	٠	•	•	•		•	•	•	•	5
REF	ERENCES	• • •		•		•			•		•			•		•	•	•	•	•	•	19
N:ON!	EVCI ATHER																					19

1LLUSTRATIONS

1	Histogram and Cumulative Frequency Distribution of the Mean Collapse Overpressure for the Exterior Walls of page Buildings	13
2	Comparison of the Cumulative Frequency Distributions of the Mean Collapse Overpressure for Exterior Walls by the Type of Building Frame	15
3	Histogram and Cumulative Frequency Distribution of the Mean Collapse Overpres. ure for the Floors Over Basement Areas of 36 Buildings	16
4	Building Subsystem Program Macroscopic Organizational Flow Chart	23
5	Building Subsystem Organizational Flow Chart	25
6	Plan View and Front Elevation of Basement Wall Used in Analysis	29
7	Reinforcing Steel Details for 8-inThick Concrete Basement Wall Used in Analysis	32
8	Yield Lines and Resistance Values for Reinforced Concrete Walls With Door Openings	34
9	Walls Assumed as Equivalent for Analysis Purposes	36
10	Comparison of Resistance Values for Walls With and Without a Door Opening	37
11	Peak Incident Overpressure at Incipient Collaps: Versus Wall Width	38
12	Plan View of Construction Joint at Intersection of Basement and Support Walls	40
13	Plan View Showing Crack at Construction Joint at the Intersection of Basement and Support Walls	41
14	Wall With Door Opening Showing Finite Plate Elements and Nodes	43
15	Peak Incident Overpressure at Incipient Collapse Versus	51

TABLE

												_
1	Abbreviations	Used	in	Flow	Chart				•		•	24

I INTRODUCTION

Under contract to the Defense Civil Preparedness Agency, Stanford Research Institute is developing a procedure for the evaluation of existing structures subjected to nuclear air blast. The objective of the program is to develop an evaluation procedure applicable to existing NSS-type structures and private homes. This report covers the final phase of the program.

Background

The Defense Civil Preparedness Agency has a number of problem areas in which an evaluation procedure for existing structures can be applied. These include:

- Survival and injury predictions
- Debris prediction
- Damage assessment
- · Selection of existing structures that provide the best protection
- Selection of existing structures that have a potential for modification to provide blast shelters.

Even with the availability of high-speed computers, it was apparent that the complexity of an overall building evaluation procedure to meet the needs of DCPA could lead to considerable unwarranted computational effort if care was not exercised in the selection of the methodology. Therefore, relatively simplified air blast loading and room-filling procedures, as well as simplified structural response analytical methods, have been used in the evaluation program.

Although the primary interest from the inception of the program has been in the behavior and collapse of the building system, the complexity

of a comprehensive evaluation procedure necessitated the establishment of a priority for determining which structural element to investigate first. It is apparent that the collapse of the exterior walls of most buildings is important to the casualties produced. This is especially true for large multistory buildings where the collapse of the exterior and interior walls could result in a large number of casualties through ejection from the building, even if the floors and frame remained intact. Since one of the primary uses of a building evaluation procedure is to provide input for prediction of survival of people located in buildings subjected to nuclear blast, the initial research effort was directed towards the development of a method to determine the response and collapse of exterior wall elements.

Subsequent to the development of the wall evaluation procedure, the procedures for analyzing the collapse of floor systems were developed. Although there were insufficient funds in the program to develop a procedure for evaluating the collapse of structural frames, it was possible to use an available elastic and inelastic computer program to analyze the dynamic response of a steel frame building and estimate the frame collapse overpressure. During the final phase of the research, a computer flow diagram was developed for analyzing a building subsystem; i.e., for predicting the time sequence of collapse of all exterior and interior walls on one floor of a building on a room-by-room basis. However, the computer program could not be written within the level of effort of the contract.

Past reports in this program have been concerned with examining exterior walls (Ref. 1),* window glass (Ref. 2), steel-frame connections (Ref. 3), two-way action walls (Ref. 4), applications to NSS buildings

^{*} References are listed after the appendix.

(Refs. 5 and 6), reinforced concrete floor systems (Refs. 7 and 8), and wood-joist floors, and frame analysis (Ref. 8).

Report Organization

Since this is the final report on the research effort, a summary of the evaluation procedure is presented in Section II. A flow chart for the analysis of all walls on one floor level of a building (a building subsystem) is presented in Section III "Building System Program." The analysis of basement walls located in areaways is given in Section IV. During the project for evaluation of existing structures, computer programs were developed for analyzing the dynamic collapse strength of three types of wall elements and five types of floor system elements. The listings for the eight programs are included in the Appendix.

Acknowledgements

The author gratefully acknowledges the assistance and guidance of G. N. Sisson and M. A. Pachuta of the Defense Civil Preparedness Agency during the conduct of this program. Also acknowledged are J. R. Rempel and J. E. Beck of SRI, and Dr. J. L. Bockholt, consultant to SRI, for their contributions to this effort.

II EVALUATION OF EXISTING STRUCTURES

Approach

The overall approach adopted in this study for the evaluation of existing structures subjected to nuclear air blast her been to formulate a procedure for examining the response of a structure over a range of incident overpressure levels to determine the overpressure at which collapse will occur. Basically, the procedure consists of (1) a method for determining the air blast loading on the structure and structural elements, (2) a method for determining the dynamic structural response up to collapse, and (3) a method for establishing the failure criterion for each structural member of interest. An iterative process is employed in which the structural response can be examined for various levels of incident overpressure and compared with a failure criterion to predict the overpressure level at which collapse of each member will occur.

Wall and Floor Evaluation Procedure

Introduction

The analytical method used in the research study was to establish the resistance function for each wall or floor element of interest by considering the approximate response mode and by assuming that the element was subjected to a uniformly distributed static load. The member was then transformed into an equivalent single-degree-of-freedom dynamic system by the use of the transformation factors for the load, resistance, and mass. The equation of motion was then solved on a computer using the numerical integration procedure described in Ref. 9. Although the approach has been

to use established analytical procedures wherever possible, it has been necessary to modify and adapt current procedures, as well as develop new methods, for specific uses.

The method followed in developing the wall and floor evaluation procedure was to (1) develop a mathematical model for each element of interest, (2) prepare the computer program, and (3) verify the analytical predictions with the available published test information on the dynamic response and collapse of wall and floor elements.

Although the mathematical models were formulated by using established analytical procedures, as noted in the referenced reports on the evaluation procedure for existing structures, the available published test data were adequate for correlation with only some of the analytical models. However, for other cases* there was a lack of definitive experimental information that adequately described the load-response relationship up to collapse. Although all mathematical models could not be correlated sufficiently with appropriate experimental data, the use of probability functions i. the procedures for predicting the incipient collapse overpressure of the elements makes the use of precise resistance functions less critical than would otherwise be the case.

For the evaluation of existing structures, failure implies collapse or disintegration of the structural element. Furthermore, the predicted collapse overpressures calculated are for the incipient collapse of the element, which is defined as that point in the response where the wall or floor can be considered as on the threshold of collapse. The incipient collapse overpressure is just sufficient in magnitude to cause a collapse of the element.

^{*} For example, the inclustic response up to collapse of a two-way lightly reinforced concrete wall with a window opening and with vertical in-plane forces acting on the wall.

Wall Analysis

The three basic types of exterior walls considered in the evaluation procedure are unreinforced concrete or masonry unit walls without arching, unreinforced concrete or masonry unit walls with arching, and reinforced concrete walls. The details of the development of the wall evaluation procedures are presented in Ref. 1 for one-way action walls and Ref. 4 for two-way walls.

For unreinforced masonry unit walls without arching and for reinforced concrete walls, resistance functions were developed for the following type of wall support conditions:

- Two-way, simply supported on four edges
- · Two-way, fixed on four edges
- Two-way, fixed on vertical edges; simply supported on horizontal edges
- Two-way, simply supported on vertical edges; fixed on horizontal edges
- One-way, simply supported on opposite edges
- One-way, fixed on opposite edges
- One-way propped cantilever
- One-way, cantilever.

For unreinforced walls with arching, resistance functions were developed for one- and two-way action walls with rigid supports.

Floor System Analysis

One of the interests of DCPA has been the possible use of basements of existing NSS structures as blast shelter areas, and therefore the research effort was primarily concerned with developing methods for predicting the collapse of various types of reinforced concrete floor systems.

However, the resistance function for wood-joist floors was also developed. The details of the floor system evaluation procedures are presented in Refs. 7 and 8.

The types of floor elements included in the evaluation procedure are as follows:

- One- and two-way reinforced concrete solid slabs
- Two-way restrained reinforced concrete solid slab
- Reinforced concrete support beam (including T-beam and joist)
- Structural steel support beam (including composite action)
- Reinforced concrete flat slab
- · Reinforced concrete flat plate
- Wood-joist floor

Probability Considerations

The analysis of actual building elements subjected to nuclear air blast requires the assumption of values for many of the physical properties of the structure that are unknown and cannot be measured without an unwarranted amount of effort. Similarly, assumptions are also required in the determination of the parameters defining the load acting on the building element. Since precise values cannot usually be specified for many of the parameters that influence the collapse of actual structures, a probabilistic approach was formulated to provide a realistic evaluation of existing structures subjected to nuclear air blast (Ref. 4).

It is apparent that the determination of the incipient collapse overpressure for a given wall or floor depends on a number of variables, at least some of which must be considered to be randomly distributed. Although the probability distribution of these random variables may be determined fairly easily, at least as approximations, the extension of this step to determine the probability distribution of the resulting

collapse overpressure is not so easy. Since it was not possible to obtain an exact distribution, it was decided to use Monte Carlo, or simulation, techniques to determine the probability distribution for the incipient collapse overpressure.

This technique uses a set of mathematically simulated wall or floor elements, each of which possesses the characteristics of some real wall or floor to determine an approximate distribution of the incipient collapse overpressure. This set of simulated walls or floors is prepared by selecting the parameters to be varied and determining the values of these parameters by randomly sampling their corresponding probability distribution functions. Each simulated wall or floor is then analyzed by using the deterministic equations developed previously. The results of these analyses provide a probability distribution of the incipient collapse overpressure. It should be noted that the collapse overpressure of a wall or floor element can also be calculated deterministically.

Air Blast Loading

An important factor in the evaluation of existing structures subject of to nuclear air blast is the determination of the pressure-time function on each structural element of interest. This is a complex problem, since, even before the blast wave interacts with the structure, the blast wave is influenced by many factors, such as weapon yield and location, weather conditions, terrain, surface type, and blast shielding. Even if it were assumed that the free-field, pressure-time relationship were known for a blast wave incident on the side of a building, the determination of the loading function on a wall or floor element is difficult because of the interaction processes. The primary difficulty arises because the structural element responds to the differential or net loading, which requires a knowledge of the loading on both the front and back surfaces.

For the evaluation of existing structures subjected co nuclear air blast, it was assumed that the blast wave before interacting with the structure was an ideal Mach waveform propagating radially outward over an ideal reflecting surface. It was also assumed that the duration of positive phase of the dynamic overpressure was equal to that of the side-on overpressure and that the negative phase could be neglected for structural response calculations. The method used to determine the pressure-time function of an exterior wall is presented in detail in Ref. 4, and involves the calculation of an exterior, interior, and net loading.

To calculate the average load-time history on the exterior wall, the conventional air blast loading scheme for a closed rectangular block is used (Ref. 10). For the front face of a building with window openings, the conventional scheme is modified by using the weighted average clearing distance presented in Ref. 11. To calculate the interior pressure build up resulting from the air blast entering the building through openings, the room-filling procedure presented in Ref. 12 is used. For each specific problem, the net wall loading is obtained by a simple summation of the exterior and interior pressure-time histories.

In addition to the ideal air blast loading, the evaluation procedure for exterior walls includes the following loading schemes:

• Triangular load

THE PERSON OF TH

- Rectangular load
- URS shock tunnel load
- Arbitrary load.

For the dynamic analysis of floor systems subjected to nuclear air blast, two load-time functions were included in the evaluation procedure. The first load type was equal to the free-field blast overpressure, except with a rise time equal to the travel time of the wave front across the floor panel. The second load type was equal to the room-filling pressure

resulting from the interaction of an ideal air blast wave with a structure with window openings. In addition, the floor evaluation procedure includes an arbitrary load shape.

It should be noted that although the net load-time function resulting from a nuclear air blast is calculated so as to analyze the dynamic response of a wall or floor element, a description of the net load-time function is not too meaningful for comparing collapse predictions for elements of various structures. Therefore, the predicted collapse overpressures given in this study are the peak incident overpressures of the free-field blast wave that results in collapse of the element.

Applications

,这是这种情况,这是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们 一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是一个人,我们就是

As part of an integrated program to develop a survey procedure for all nuclear weapon effects, Research Triangle Institute (RTI) made an initial on-site field survey during November 1970 of five NSS buildings in Detroit, Michigan. The survey was conducted primarily to obtain a complete structural description of buildings that would be adequate for predicting building damage and casualties. The results of the field survey were recorded on forms and included sketches and photographs. A complete copy of this information, together with the building plans, was provided to SRI for analysis of the buildings. The results of the dynamic analysis of the exterior walls of the five Detroi: buildings are presented in Ref. 5.

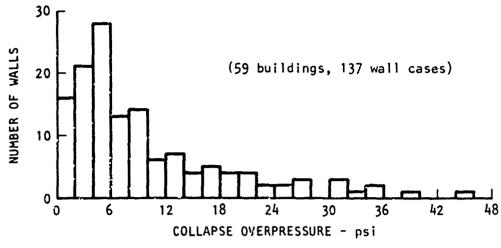
To provide additional input information for the development of the all-effects survey, RTI made a second on-site field survey in July 1971 of five buildings in the vicinity of Greensboro, North Carolina. As in the analysis of the Detroit buildings presented in Ref. 5, two dynamic analyses were made of each of the Greensboro buildings. The first analysis was made using the data obtained during the RTI on-site survey.

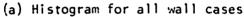
A second analysis of the same building was then made independently using data obtained from the actual building plans. This procedure provided a check on the adequacy of the survey technique and the proposer, ield survey data form, and emphasized areas of possible improve the fine results of the dynamic analysis of the exterior walls of the five Greensboro-High Point buildings are presented in Ref. 6.

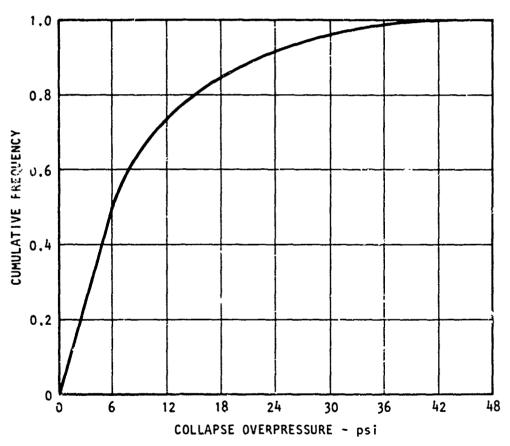
In addition to the two research studies to develop an all-effects shelter survey procedure, RTJ also collected data on a national sample of NSS buildings for the Engineering Directorate of DCPA (Ref. 13). Of the 219 NSS buildings comprising the national sample, the SRI evaluation procedure was used to predict the collapse overpressure of the exterior walls for 50 of the buildings and of floors over basement areas for 36 of the buildings. Since the results of the dynamic analyses of the walls and floors of actual buildings are of interest to the evaluation of existing structures program, a short summary of the findings are presented in this report.

Walls

The collapse predictions for the exterior walls of NSS buildings required the dynamic analysis of 137 wall cases. These walls represent 59 NSS buildings, which can be categorized as 15 load-bearing wall buildings, 23 structural steel frame buildings, and 21 reinforced concrete frame buildings. Figure 1 shows a histogram and cumulative frequency distribution of the mean collapse overpressure for the 137-wall population. The data indicate that for the 59 sample buildings, 50 percent of the exterior walls are predicted to have a mean collapse overpressure of 6 psi or less, and 90 percent are predicted to have a mean collapse overpressure overpressure of 22 psi or less.







(b) Cumulative frequency distribution for all wall cases

FIGURE 1 HISTOGRAM AND CUMULATIVE FREQUENCY DISTRIBUTION OF THE MEAN COLLAPSE OVERPRESSURE FOR THE EXTERIOR WALLS OF 59 BUILDINGS

The effect of the type of frame on the collapse strength of exterior walls is indicated by the cumulative frequency distributions for the wall collapse overpressures shown in Figure 2 for the three major building frame categories. Although the data are considered as insufficient to establish quantitatively the effect of frame type on wall collapse overpressure level, the trends in the data are apparent. The mean values of the collapse overpressures for walls are about 4.5 psi for load-bearing wall buildings, 6 psi for reinforced concrete frame buildings, and 10 psi for steel frame buildings.

Floors

THE PARTY OF THE PROPERTY OF THE PARTY OF TH

The collapse predictions for the floor systems over basement areas of NSS buildings required the dynamic analysis of 82 floor cases, which represent 36 buildings. Figure 3 shows a histogram and cumulative frequency distribution of the collapse overpressures for all floors. As noted on the figure, the collapse overpressure for floors over basement areas ranged from about 2 to 55 psi, with 50 percent of the floors predicted to collapse at 7 psi or less and 90 percent predicted to collapse at 18 psi or less.

Frame Analysis

A continuing concern in evaluating the collapse overpres ure of existing buildings has been the relative blast strength of the exterior walls and frames of multistory buildings. To predict the collapse overpressure of the exterior walls for the existing NSS buildings discussed in the previous subsection, it was assumed that the structural frame did not collapse at a lower overpressure than that predicted for the exterior walls. For weak-walled buildings, such an assumption is reasonable. In fact, it is often assumed for the analysis of blast loaded frame buildings that the exterior walls can be considered as frangible,

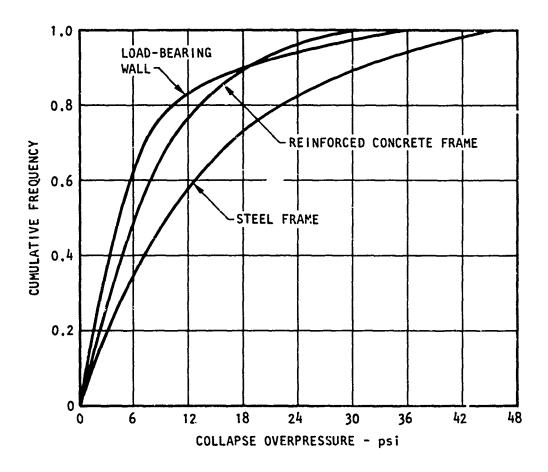
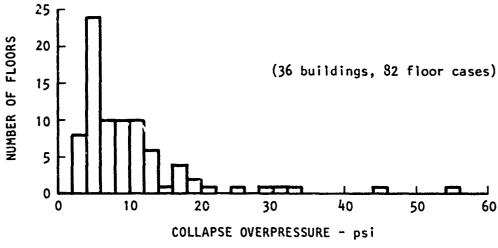
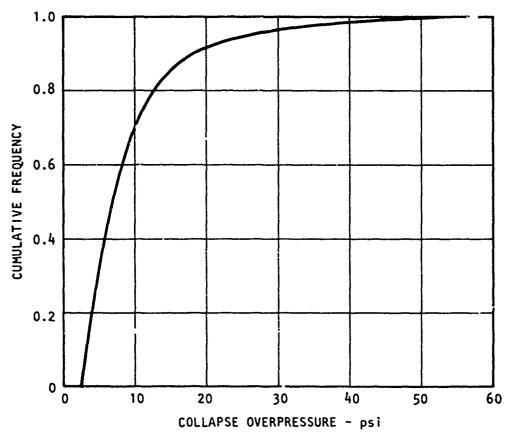


FIGURE 2 COMPARISON OF THE CUMULATIVE FREQUENCY DISTRIBUTIONS OF THE MEAN COLLAPSE OVERPRESSURE FOR EXTERIOR WALLS BY THE TYPE OF BUILDING FRAME



and and the second of the seco





(b) Cumulative frequency distribution for all floor cases

FIGURE 3 HISTOGRAM AND CUMULATIVE FREQUENCY DISTRIBUTION OF THE MEAN COLLAPSE OVERPRESSURE FOR THE FLOORS OVER BASEMENT AREAS OF 36 BUILDINGS

and therefore, that the wall loading transferred to the frame can be approximated by an impulse loading. However, for many of the actual buildings analyzed, the strength of the exterior walls under blast loading was sufficiently high to make it doubtful that the frame could survive at the overpressure level required to collapse the walls. For example, Figure 1 shows that 50 percent of the walls of the NSS buildings analyzed were predicted to collapse at an overpressure level greater than 6 psi. The strength of the exterior walls is important in calculating the collapse of the frame, since, for a given overpressure level, the blast loading on the total wall area can be much more severe than the blast loading on the frame alone plus an impulse loading from a frangible-type wall.

and the second second

Company of the second of the s

To investigate the relative strength of the exterior walls and frame of a building would require a comprehensive computer program that includes inelastic response under dynamic loading as well as realistic frame collapse mechanisms. Since such a program was not available, a computer program for analyzing the elastic and inelastic dynamic response of two-dimensional structural frames was used (Ref. 14). Although the program does not include frame collapse mechanisms, it was felt that the results would provide a basis for estimating the possible collapse strength of a building frame relative to the strength of the exterior walls.

The building selected for analysis was the North Carolina National Bank, Greensboro, North Carolina. The building has a structural steel frame, and consists of eight stories, with a height of about 110 ft, and plan dimensions of 50 ft by 115 ft. A complete description of the bank building and the results of the analysis of the exterior walls are given in Ref. 6. The exterior walls on the upper stories consist of a 4-in.-thick brick veneer, which is continuous over the frame members, and an 8-in.-thick terra cotta backing wythe, which is inset in the frame and parged to the brick veneer.

Three different types of frame analyses were performed: (1) an elastic analysis to determine the strength of the inset walls on the ends of the building acting as shear walls, (2) elastic frame analyses at various overpressure levels, and (3) inelastic frame analyses at various overpressure levels. The exterior walls of the building were previously found to have an incipient collapse overpressure (50 percent probability) of 15.7 psi (Ref. 6), and therefore the blast loading for the frame analyses are calculated for a box-type building with nonfailing exterior walls with window openings.

是一个人,我们是一个人,我们是一个人,我们们是一个人,我们们们们们是一个人,我们们们们的,我们们们们的一个人,我们们们们们们的一个人,我们们们们们们们们们们们们

The results of the analyses provide an estimate of the collapse strength of the structural steel frame of the bank building under blast loading, even though the computer program used cannot predict frame collapse. The results of the first analysis, for the shear wall building, indicated that the cracking of the exterior walls acting as shear walls occurs at an incident overpressure level of less than 2 psi, since the moment ratios (computed moment/yield moment) for the shear walls are above 35 for a 2-psi incident overpressure level. Therefore, it was essumed for the other two types of analyses that the inset end walls acting as shear walls contributed negligible resistance to the frame, ... that the analysis of the frame acting alone should adequately model the building behavior under lateral load.

An elastic analysis of the frames for 16 psi, which approximated the incipient collapse overpressure of the exterior walls, indicated a maximum stress ratio (computed stress/stress at yield) of about 20. Since the elastic analysis is much simpler than the inelastic analysis, the frames were then analyzed for elastic behavior at 5-, 4-, and 3-psi overpressures to obtain an estimate of the frame strength. The results of the elastic analyses indicated that the strength of the frames was in the range of the lower overpressures examined, and therefore the inelastic frame analyses were run at 3-, 4-, and 5-psi overpressure levels.

The inelastic analyses indicated maximum ductility ratios at 3 ps. of 13.4 for the beams and 20.6 for the columns, and maximum moment ratios of about 1.64 for the beams and columns. At the 4-psi overpressure level, the maximum ductility ratios were 29.5 in the beams and 42.2 in the columns, and the maximum moment ratios were in excess of 2. A simplified hand calculation indicated that the P-A effect, which is not included in the computer program, would increase some of the moment ratios by over 50 percent. The calculated lateral deflection of the top story of the building was about 21 ft for the 3-psi overpressure level, and 47 ft for the 4-psi level. If it is assumed that the frame would collapse at a ductility ratio of about 50, then the estimated collapse overpressure is between 3-, and 4-psi incident overpressure level. The actual blast strength could be much less, since the effect of the axial column load (P-A effect) and frame collapse mechanisms, such as column buckling or instability, are not accounted for in the analytical procedure.

It should be noted that the frame of the "orth Carolina National Bank building appears to be constructed of relative_y light structural shapes that may not necessarily be typical of most NSS structures. In any event, however, the analysis indicated that the blast resistance of the frame of the building was much less than (possibly only one-fourth) that of the exterior walls. This, of course, is an important consideration in predicting either building damage or casualties.

Building System Computer Program

Since the inception of the evaluation project, the intention has been to develop a procedure for the analysis of a building system that would be applicable to various requirements of DCPA. For predicting damage to NSS structures in this program, it was assumed that each wall analyzed could be treated as though it were the "front face" of the building with an ideal blast wave advancing at normal incidence to it.

The time-sequence of collapse of various building elements, or the effect of the engulfment of the building by the blast wave, is not directly accounted for in the current computer programs. For example, to use the computer codes for predicting the collapse of all exterior walls of a building (i.e., front, side, and back) for the blast approaching from one direction it is necessary to use engineering judgment in providing realistic input data. Such a procedure was used to correlate analytical predictions with nuclear field tests of brick load-bearing-wall houses (Ref. 4).

In order to systematize the building evaluation procedure, a flow diagram was prepared during the current effort that outlines the computer analysis of all wall elements on one story of a building. The results are presented in Section III.

III BUILDING SYSTEM PROGRAM

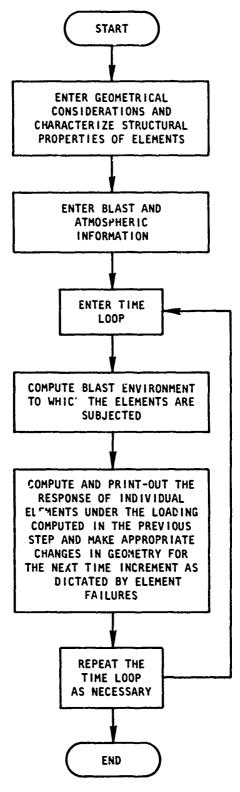
The purpose of this phase of the research was to examine a method for systematizing the collapse predictions for blast loaded buildings. Since the inception of the existing structures evaluation project, the intention has been to develop a procedure for the analysis of a building system that would be applicable to various requirements of DCPA, such as damage assessment, survival and injury predictions, and debris predictions. Because of the complex nature of analyzing the response and collapse of buildings under dynamic loading, as well as the difficulty of calculating precise blast loadings on each element in a complex building geometry, the approach has been to establish a sound technical basis for the analysis of each building element. It has been necessary to derive realistic mathematical response models before computer codes could be prepared for the various structural elements of interest. Although the original intent was to develop subroutines for each element for the eventual incorporation into a single computer program, the need to analyze existing buildings preceded the completion of a building system program. Instead, relatively complete computer programs, as opposed to building element subroutines, were prepared for each building element; i.e., for each element the computer code consists of a main routine, a subroutine to calculate the resistance function, a subroutine to calculate transformation factors, subroutines to calculate the exterior and interior blast pressures and net load on the element, and a subroutine for calculating the probability of collapse. The development of these individual element programs diverted some effort from the development of a building system program; however, the individual programs permitted analyses of existing

buildings to be performed much sooner than would otherwise have been possible. Also, the availability of individual element programs was convenient for the correlation of experimental data with analytical models.

Essentially, the building element computer programs were developed as research tools for use in developing realistic analytical prediction models, and for performing limited analyses of buildings rather than for performing a large number of analyses of existing buildings. However, as originally intended, it has become apparent that a computer program for analyzing a building system, or at least a building subsystem, would be useful. Therefore, during this phase of the research effort, the feasibility of incorporating the previously developed computer programs for wall analysis into a program for the analysis of a subsystem of the overall building system was examined. Specifically, a relatively detailed flow diagram was prepared that outlines the procedure for analyzing all exterior and interior walls on one story of a building. During this phase, the computer flow chart was prepared, but the computer program was not written.

A subsystem analysis approach was chosen as the most expedient and logical next step in the development of an overall building evaluation procedure. Figure 4 shows a macroscopic organizational flow chart of the proposed program to be used. The subsystem is one floor level of a building that can be oriented at any angle to the blast wave front. For a given free-field overpressure level, the net loading on each wall element will be computed and the wall response calculated on a room-by-room basis as the blast wave moves through the building.

At the present time the evaluation procedure has the capability of calculating the exterior pressure-time environment resulting from an interacting blast wave, and can compute the resulting interior pressure



The property of the property o

THE THE PARTY OF T

FIGURE 4 BUILDING SUBSYSTEM PROGRAM MACROSCOPIC ORGANIZATIONAL FLOW CHART

State of the state

build-up to a single room. For the subsystem program, it will be necessary only to extend the capability to calculate the interior pressure in a multiroom complex by the method presented in Ref. 12. Also, as discussed previously, the mathematical models for predicting the response and collapse of walls are available. The remaining task consists of combining the loading and response models into a single subsystem program that includes the geometry of the floor of a building.

Figure 5 shows a detailed organizational flow chart of the proposed subsystem program. Table 1 is a list of abbreviations used in the flow chart.

Table I

ABBREVIATIONS USED
IN FLOW CHART

Abbreviation	Word Represented
EXT	EXTERIOR
INT	INTERIOR
OPNG	OPENING
FLR	FLOOR
PR	PAIR
ARVD	ARRIVED
RM	ROOM
NRST	NEAREST

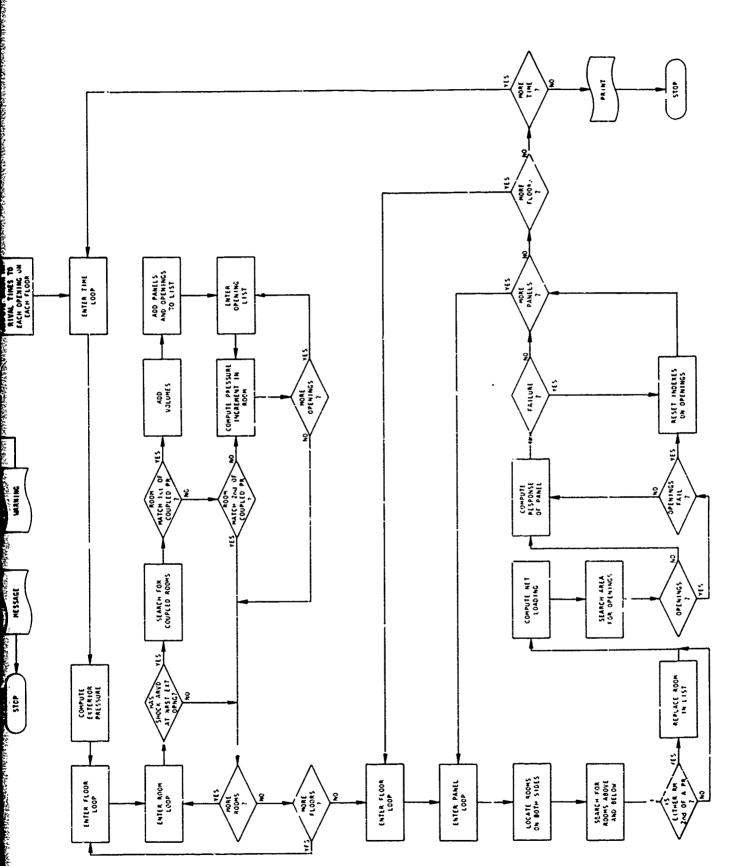


FIGURE 5 BUILDING SUBSYSTEM ORGANIZATIONAL FLOW CHART

IV ANALYSIS OF BASEMENT WALLS

The objective of this phase of the effort was to examine the blast resistance of exposed, reinforced concrete basement walls with door openings to determine the feasibility of retrofitting EOCs with blast doors. The primary purpose was to determine if reinforced concrete basement walls located in areaways of existing buildings could resist 10-psi blast overpressure.

Approach

In past studies, the collapse strength of blast loaded walls of existing buildings has been determined for various types and configurations of walls. Although mathematical models have been developed for walls with window openings, the procedures were not extended to include walls with door openings. Since there was insufficient time and funds to develop a generalized model and computer program for calculating the resistance and collapse of the wall configuration of interest, the following three-phase approach was used:

- (1) A detailed yield-line analysis of several specific reinforced concrete walls with door openings was made to establish the static resistance over a limited range of wall widths.
- (2) The computer programs developed for the building evaluation procedure for DCPA for analyzing the collapse of wall elements was used to generate resistance functions for walls without door openings. The results were then compared with those obtained from the yield-line analysis for walls with door openings to determine the feasibility of using the existing computer programs to simulate the dynamic response and

collapse of walls with door openings. If the resistances for the two wall types was found to be not comparable, then it would be necessary to hand calculate a resistance function for each wall case.

(3) An existing finite element computer program was used to analyze the static behavior for a few wall cases with door openings to determine if shear or stress concentrations could conceivably produce a wall failure not predictable by the other analyses.

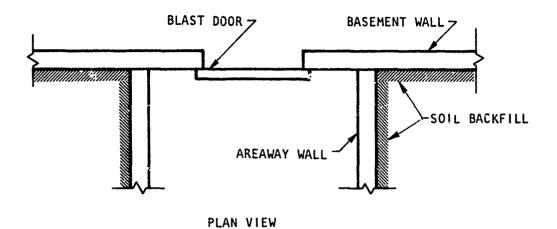
Wall Design

and the second of the second s

The basemen, wall considered in this study was located in an open areaway such that the wall and door are fully exposed to the air blast effects. For simplicity, a standard door opening of 3 ft 8 in, wide by 6 ft 8 in, high was adopted; this is a two-unit-of-exit-width door opening as specified in Ref. 15. It was also assumed that the door was closed for all analyses and that it did not fail. The general layout of the basement wall analyzed is shown in Figure 6. As noted in Figure 6, it was assumed that the wall was bounded at the top and bottom by the first story and basement floors, and on the sides by the vertical areaway walls. The basement wall was continuous at the areaway wall intersection, and no interior walls abutted the basement wall in the vicinity of the areaway. The soil backfill adjacent to the areaway and basement walls extended to the first story level.

Since specific wall details were not provided, it was assumed that the basement walls were designed according to the 1963 ACI code (Ref. 16). Pertinent requirements of the code applicable to basement walls are:

- Area of horizontal reinforcing steel is not less than 0.0025 times the area of the reinforced section of the wall.
- Area of vertical reinforcing steel is not less than 0.0015 times the area of the reinforced section of the wall.



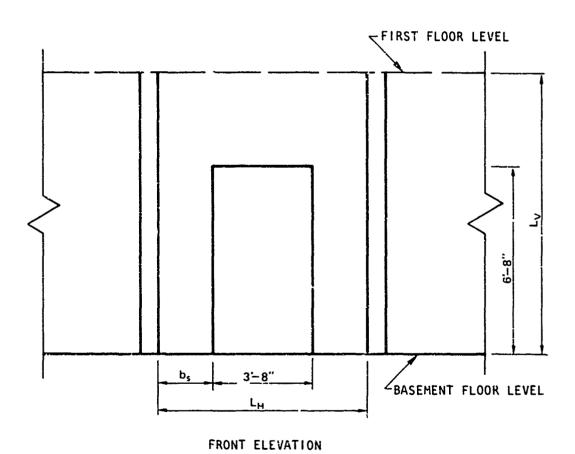


FIGURE 6 PLAN VIEW AND FRONT ELEVATION OF BASEMENT WALL USED IN THE ANALYSIS

- In addition to the above, two No. 5 bars are required around the door opening, and extending a distance of 24 in. beyond the opening.
- Minimum bar size is No. 3 at 18 in., center-to-center.
- Basement wall is assumed to be anchored to the floors and areaway walls with reinforcement equal to that in the wall.
- · Minimum basement wall thickness is 8 in.

In addition, since the most efficient use of the reinforcing steel for the basement walls with soil backfill would dictate that the reinforcement be placed near the inside face of the wall, it was assumed that the reinforcement for the basement wall located in the areaway was also near the inside face.

Since it was assumed that the basement wall in the areaway was identical to that with soil backfill, the strength of a basement wall with minimum code reinforcement and with soil backfill was checked for adequacy as follows:

The lateral static soil pressure against the wall is

 $p_h = K_c h_0,$

是是不是一种,我们是是一种,我们也是是一种,我们也是是一种,我们也是是一种,我们也是是一种,我们也是是一种,我们也是是一种,我们也是是一种,我们也是一种,我们就

where K_c = lateral soil coefficient (assumed as 0.30 for well-drained soil)

h = soil depth

o = unit weight of soil.

For height of wall, $L_v = 10.0$ ft,

 $p_{h} = (.3)(10)(100) = 300 \text{ psf (bottom of wall)}.$

The maximum applied moment for a one-way wall simply supported at the top and bottom and with a triangular load function is

 $M = 0.1283 P_{\tau}L_{\nu}$

where P_{τ} = total applied load.

Therefore, the applied moment is equal to

$$M = (.1283)(300x\frac{10}{2})(10) = 1925 \text{ ft-lb/ft}$$

For a reinforced concrete section with tensile reinforcement only, the ultimate bending moment of the section is

$$N_u = \varphi \left[A_s f_y (d - \frac{a}{2}) \right]$$
where $a = \frac{A_s f_y}{0.85 f_b^*}$.

For a reinforced concrete basement wall with minimum thickness, $t_{_{\rm K}}=8$ in., the area of vertical reinforcement is

$$A_s = (8)(12)(.0015) = 0.144 \text{ sq in./ft of wall,}$$

$$A_{s} = No, 3@9 in.,$$

and

d =
$$8 - (\frac{3}{4} + \frac{1}{2} \times \frac{3}{8}) = 7.06$$
 in.

For $f_c' = 3000$ psi and $f_y = 33,000$ psi

$$a = \frac{(.144)(33,000)}{(.85)(3000)(12)} = 0.1553,$$

and with a coefficient of flexure $\phi = 0.90$, the ultimate bending moment is therefore

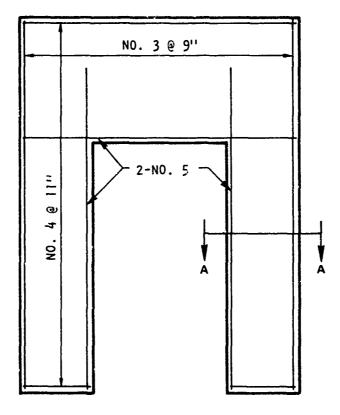
$$M_u = (.90) \left[(.144)(33,000)(7.06 - \frac{.1553}{2}) \right] = 29,862 in.-lb/ft$$

$$M_{ij} = 2489 \text{ ft-1b/ft}$$

Since $\rm M_u > M$, a fully buried, 10-ft-high by 8-in.-thick reinforced concrete basement wall with minimum code reinforcement is adequate to resist the pressure from a well-drained soil. Figure 7 illustrates the reinforcing steel details assumed for the 8-in.-thick basement wall used in the analysis.

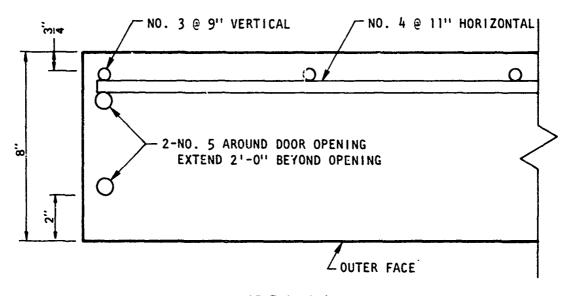
Analysis

Various types of analyses were performed because a mathematical model that adequately represented the dynamic behavior and collapse of



ELEVATION OF BASEMENT WALL

THE PROPERTY OF THE PROPERTY O



SECTION A-A

FIGURE 7 REINFORCING STEEL DETAILS FOR 8-INCH THICK CONCRETE BASEMENT WALL USED IN ANALYSIS

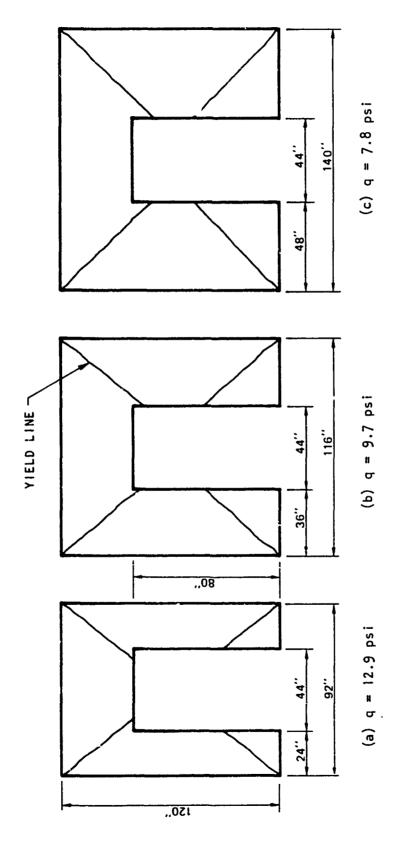
basement walls with door openings had not been developed previously.

The object was to use the available analytical tools to estimate with a good degree of confidence the collapse strength of basement walls in areaways without actually expending the time and effort required to develop a realistic mathematical model and writing the computer code.

Wall With Door Opening

The work-energy method from the yield-line theory for reinforced concrete slabs was used to calculate the flexural resistance for reinforced concrete walls with door openings. The method is outlined in Ref. 4, and wil! not be repeated here. The purpose of performing a limited number of yield-line analyses was to compare the resistance of walls with door openings with that of walls without door openings. If the resistance values for the two wall types were found to be approximately the same, then the available dynamic computer programs for wall elements could be used to provide interim collapse predictions for a variety of wall cases. However, if the resistances for the two wall types were found to be different, then the resistance values calculated for the walls with door openings could be used to perform a limited number of dynamic analyses.

The reinforcing steel details used for the analysis are shown in Figure 7. Since the calculation of the yield-line moments is a relatively tedious hand calculation requiring trial and error solutions, a minimum number of wall cases was considered. Therefore, only an 8-in-thick wall with a height of 120 in. was treated; walls were analyzed with widths, L, of 92 in., 116 in., and 140 in. The calculated yield lines and resistance values for the three walls are shown in Figure 8.



THE TAXABLE STATES OF THE PROPERTY OF THE PROP

YIELD LINES AND RESISTANCE VALUES FOR REINFORCED CONCRETE WALLS WITH DOOR OPENING FIGURE 8

Wall Without Door Opening

e de la company de la comp

A series of computer runs was made using the SRI programs developed previously for two-way action reinforced concrete walls (Ref. 4). The vertical load, $P_{\rm v}$, in the plane of the wall was assumed to be zero; i.e., the wall was considered as a panel wall that did not carry any loads from the floor levels above. The horizontal and vertical reinforcement for the walls without door openings was the same as that for walls with door openings, except that for walls without door openings the two No. 5 bars around the opening shown in Figure 7 were deleted, as shown in Figure 9.

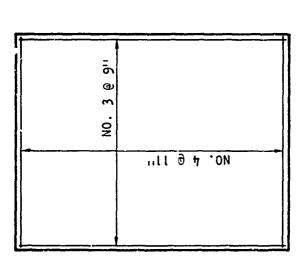
The values of the resistance for walls without door openings are plotted in Figure 10, where they are compared with the resistances calculated by the yield-line theory for walls with door openings. From the figure, it is apparent that the maximum resistance, q, for the two wall cases is approximately equal for the range of wall widths considered. Based on this limited study, it was assumed for the surpose of performing preliminary dynamic collapse predictions for reinforced concrete basement walls that the flexural resistances of wall with and without a door opening, and reinforced as shown in Figure 9, were equal.

To estimate the collapse of blast loaded basement walls with door openings, dynamic analyses were performed for a range of wall widths, two wall thicknesses, and two wall heights. The results of these analyses are shown in Figure 11. It should be noted that, since it was assumed that the basement walls were panel walls with $P_{\rm v}=0$, and did not arch, the curves can be considered as lower bound predictions for each wall type shown.

The collapse criterion adopted for walls in the evaluation procedure was based on the collapse of the wall in flexure; as discussed in Ref. 4, collapse is predicted as a result of excessive steel strain, instability, or an excessive ductility ratio. From studies made during the development

NO. 3 @ 9".
NO. 4 @ 9".

identialis en la companya de la comp



(b) Wall With 3'-8" x 6'-8" Door Opening

(a) Solid Wall Without Door Opening

FIGURE 9 WALLS ASSUMED AS EQUIVALENT FOR ANALYSIS PURPOSES

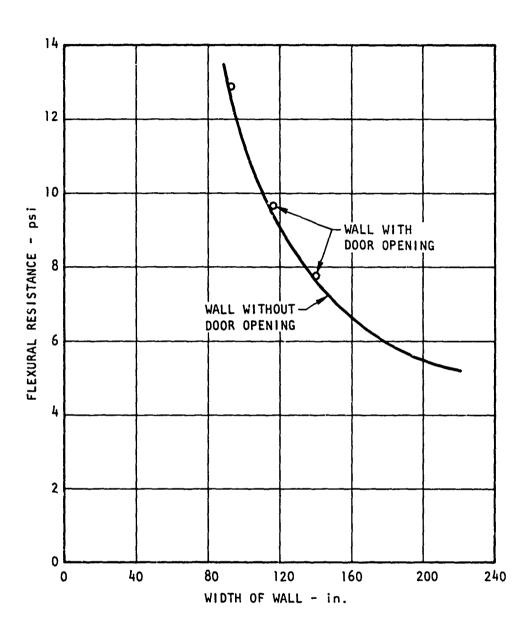


FIGURE 10 COMPARISON OF RESISTANCE VALUES FOR WALLS WITH AND WITHOUT A DOOR OPENING

WALL PARAMETERS

= 96 in. and 120 in. 92 in. tc 240 in. = 8 in. and 12 in.

= 3,750 psi

tw fdc fdy = 44,000 psi

= $0.0025 A_c$ (horizontal) = $0.0015 A_c$ (vertical)

γ = 145 pcf

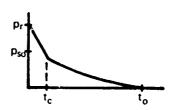
= 0

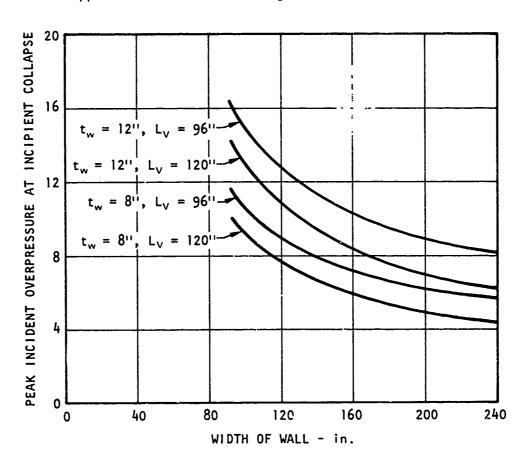
Door opening: 3'-8" x 6'-8" Support case: fixed four edges

LOAD PARAMETERS

= 1 Mt= 0

= 6.7 ft



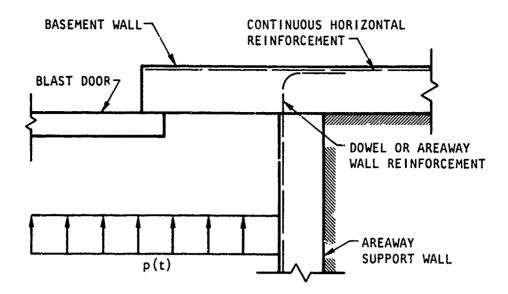


PEAK INCIDENT OVERPRESSURE AT INCIPIENT COLLAPSE FIGURE 11 VERSUS WALL WIDTH

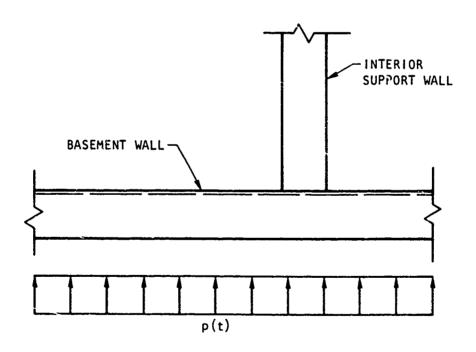
Two-Way Reinforced Concrete Basement Wall In Areaway

of the original wall evaluation procedure, it was determined that for lightly reinforced members with the usual type of supports, a shear failure would not be expected to occur, and if it did, it would not be expected to result in collapse of the wall. However, for the basement walls considered in this study, there were two factors that could influence the collapse mechanism assumed in the original procedure. First, the door opening could produce both higher local shears and stress concentrations than found in solid walls. Second, the reaction of the basement wall at the construction joint between the basement wall and the areaway support wall is opposite in direction to that usually encountered. That is, the reaction places the joint between the basement and areaway well; in tension; the areaway wall provides lateral support to the basement wall only through development of tensile forces in the reinforcing steel continuous through the joint shown in Figure 12a. This, of course, is opposite to the usual case where the lateral load on the wall forces the member to bear directly against its support as shown in Figure 12b.

There are two important implications as a result of the type of lateral support provided by the areaway walls that could influence the collapse predictions of the basement walls shown in Figure 11. First, the reinforcing steel between the basement and areaway walls could fail in tension, which would result in one-way wall action between floor levels rather than two-way action as assumed in the analysis. Second, under the lateral blast load the basement wall cracks along all supports at small elastic deflections as a result of the negative moment developed. As illustrated in Figure 13a, the reinforcing steel is near the inside surface of the resement wall and the effective depth of the steel for resisting this negative moment is measured from the inside wall surface; for the assumed wall this distance, d, would be only 1-3/8 in. Because of the cracks at the support, the thickness of the concrete available for resisting the shear force is only equal to d, and therefore a shear

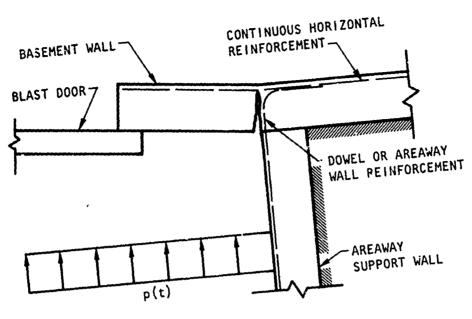


(a) Basement Wall in Areaway



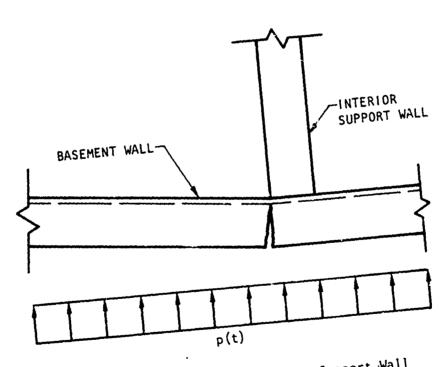
(b) Basement Wall With Interior Support Wall

FIGURE 12 PLAN VIEW OF CONSTRUCTION JOINT AT INTERSECTION OF BASEMENT AND SUPPORT WALLS



(a) Basement Wall in Areaway

,这种是一种,我们就是不是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一个,我们是一种,我们就是一种,我们就是一种,也是 第一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种,我们就是一种, THE PARTY OF THE P



(b) Basement Wall With Interior Support Wall

FIGURE 13 PLAN VIEW SHOWING CRACK AT CONSTRUCTION JOINT AT THE INTERSECTION OF BASEMENT AND SUPPORT WALLS

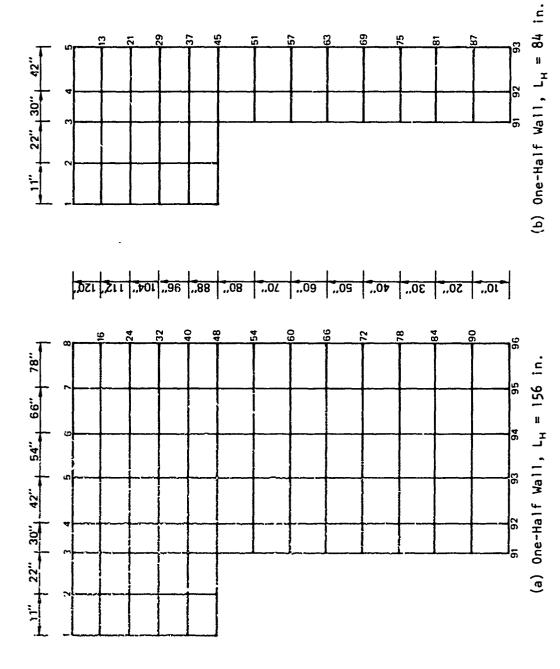
failure could occur early in the wall response. For the type of walls considered when developing the evaluation procedure, the reaction was assumed to act against the lateral interior support wall and a shear failure was not considered as a wall collapse mechanism. That is, a shear failure at the lateral support wall would precipitate a tensile membrane mode of response in the basement wall, rather than a wall collapse, and the reactive forces would be transferred to the support by tensile action of the continuous reinforcement; this is illustrated in Figure 13b. For a basement wall located in an areaway, a shear failure in the wall at the construction joint between the basement and areaway walls would result in rupturing of the concrete and tearing out of the continuous reinforcing steel in the basement wall; the small colorete cover over the reinforcement shown in Figure 13a could not be expected to resist the reactive forces of the basement wall.

Since the mathematical models developed for the evaluation procedures could not be used to investigate the details of localized internal stresses and reactions for the complex door opening wall geometry, an available static finite element computer program was used to estimate probable failure modes.

Tinite Element Wail Program

and discourance of the second of the selected of the second of the secon

Although the available finite element program is a powerful analytical tool, it is limited to static, elastic structural systems. Therefore, the primary value of the results for this study was to provide a basis for estimating possible collapse mechanisms; the results were of only limited quantitative value. The two basic wall configurations analyzed are illustrated in Figure 14; because of symmetry, it was only necessary to consider one-half the wall. The wall model consisted of an assemblage of plate elements, and only the support nodes are numbered on the figure. The useful output information included the deflections, internal loads,



WALL WITH DOOR OPENING SHOWING FINITE PLATE ELEMENTS AND NODES FIGURE 14

and the second contract of the second contrac

and extreme fiber stresses in the plates, and the reactions at each support node. For this exercise, only an 8-in.-thick wall with a 120-in. height was considered. The walls were analyzed for a static lateral load of 10 psi applied uniformly to the wall and door; the deer load was distributed to the wall nodes adjacent to the opening.

The primary reason for conducting the finite element analysis was to provide more detailed information about the reactions at the construction joint formed by the intersection of the basement and areaway walls than was available from the other analyses. For the wall with $L_{\mu}=156$ in., the following values for the basement wall reactions at the basement/areaway wall joint were obtained for the nodes shown in Figure 11:

	Reaction,	
Node	<u>1b</u>	
16	1,904	
2.1	2,915	
32	3,801	
40	-3,165	
48	11,785	
54	6,125	
60	6,079	
66	6,027	
72	5,684	
7 8	5,081	
81	1,194	
90	2,680	

The maximum reaction predicted is 11,785 lb at node 48; next is 6,125 lb at node 54. Since the actual wall had continuous support rather than point support at each node, it is appropriate to average the reaction between two adjacent nodes. Therefore, the maximum average applied shear along the basement/areaway wall joint is

$$V = \frac{11,785 + 6,125}{(2)(10)} = 896 \text{ lb/in.}$$

adirection of the contraction of

To determine whether this magnitude of applied shear would result in a shear failure in the basement wall, it was necessary to calculate the shear resistance of the wall. From Ref. 7, the unit shear resistance at the support of a reinforced concrete member is

$$(v_c)_s = \frac{2.28\sqrt{f_c^*}}{1-2d/L} + \frac{3000p}{1-d/L} \le \frac{3.5\sqrt{f_c^*}}{1-2d/L}$$

For the basement wall, the horizontal reinforcement is

$$A_{t} = 0.240 \text{ sq in./ft,}$$

and d = 1.38 in. for a racked concrete section, therefore

$$p = \frac{0.240}{(12)(1.38)} = 0.01449.$$

Substituting these quantities into the above equation, the unit shear is

$$(v_c)_s = \frac{2.28\sqrt{3000}}{1-(2)(1.38)} + \frac{(3000)(.0149)}{1-\frac{1.38}{156}} = 171 \text{ psi.}$$

Since the total shear resistance at the support would be

$$(V_c)_s = (v_c)_s bd$$

then

$$(V_c)_s = (171)(1)(1.38) = 236 \text{ lb/in.}$$

This value is, of course, much less than the shear force of 896 lb/in. resulting from a uniform static load of 10 psi. For estimating purposes only, if it is assumed that the dynamic shear resistance is 25 percent greater than the static, and that a dynamic load factor (DLF) of 1.15 is appropriate for the load type, then a rough estimate of the level of the blast load that would result in a shear failure in the wall would be

$$p_{,,,} \approx \frac{(236)(1.25)(10)}{(1.15)(896)} \approx 2.9 \text{ psi.}$$

For the basement wall with $L_a=84$ in., two wall cases were considered; (1) simply supported on four edges, and (2) fixed on four edges. The values of the reactions along the basement/areaway wall joint for the simply supported wall with a 10-psi static load were as follows:

	Reaction,
Node	1b
13	1,520
21	2,318
29	3,087
37	-3,839
-15	7,76-1
51	3,924
57	3,820
63	3,976
69	4,027
7 5	3,904
81	3,531
87	2.467

Using the same method as before for two adjacent nodes, the predicted maximum average shear along the basement/areaway wall joint is

$$V = \frac{776.1 + 392.1}{(2)(10)} = 58.1 \text{ lb/in.}$$

Again, a rough estimate of the blast overpressure that would result in a shear failure in the basement wall would be

$$p_{so} \approx \frac{(236)(1.25)(10)}{(1.13)(584)} \approx 4.4 \text{ psi.}$$

Based on the above rough estimates for 8-in.-thick reinforced concrete walls with door openings, it could be concluded that a shear failure will occur at blast overpressures less than 5 psi if the horizontal distance from the edge of the door opening to the areaway wall is greater than about 18 in., i.e., for $L_{_{\rm H}} \geq 80$ in. However, since this estimate is based on a cracked concrete section, it is of interest to examine the effect on the strength of the wall of the concrete cracking along the supports.

As the exposed horizontal distance between the edge of the door opening and the areaway support wall is increased, the probability of a shear failure occurring in the basement wall is also increased. For example, if the horizontal distance is equal to the wall thickness,

 $t_w=8$ in. ($L_H=60$ in.), then the full thickness of the concrete wall section is effective in resisting the applied shear force because the modulus of rupture of the concrete has not been exceeded and the concrete section is uncracked. Since the shear resistance for this case is much greater than the applied shear, the wall would not be expected to experience a shear failure. As the width of the wall is increased to 84 in., the values of the reactions and moments along the basement/areaway joint for an 8-in.-thick concrete wall fixed on four edges and with a 10-psi static load are as follows:

	Reaction,	Moment
Node	<u> 1b</u>	in1b
13	-26	1,149
21	1,187	10,813
29	1,738	20,043
3 7	2,726	37,845
45	5,031	55,746
51	3,786	49,166
57	4,076	52,550
63	4,267	54,022
69	4,329	52,165
7 5	4,103	45,468
81	3,125	31,006
87	167	7,190

The maximum moment predicted for two adjacent nodes is 52,550 in.-1b for node 57; next is 54,022 in.-1b for node 63. Therefore, the maximum average moment along the basement/areaway wall joint is

$$M = \frac{52,550 + 54,022}{(2)(10)} = 5329 \text{ in.-lb/in.}$$

To estimate if the wall cracks under the applied moment, it is necessary to calculate the resisting moment for the uncracked wall section. For a linear relationship between stress and strain across the section of the wall, the maximum resisting moment is equal to

$$M_{u} = \frac{f_{z}bt_{x}^{2}}{6}.$$

For

SANTA SANTA DA MANTANTA NA SANTA SANTA SANTA NA SANTA SA

$$f_r = 8\sqrt{f_{4c}^{\prime}}$$
,
 $M_u = \frac{(8)\sqrt{3750(1)(8)^2}}{6} = 5226 \text{ in.-1b/in.}$

which is approximately equal to the applied moment. Therefore, an 8-in-thick concrete wall with a horizontal distance between the edge of the door and the areaway support wall of about 20 in. (L_{μ} = 84 in.) would be expected to crack and experience a shear failure along the basement/areaway wall joint at a blast overpressure level somewhat less than 10 psi. This, of course, indicates a much greater blast strength for the uncracked wall case than was estimated above for the cracked wall case.

文学、从公司的任何在对方的证据的

One-Way Reinforced Concrete Wall (Without Arching)

As discussed in the previous subsection, under dynamic load the initial shear failure in an 8-in.-thick, two-way reinforced concrete basement wall located in an areaway would occur at the points of maximum shear along the joint between the basement and areaway walls at relatively small wall deflections. The shear failure would result in the initiation of one-way wall action (i.e., the lateral support of the areaway wall would be lost) at a time shortly after arrival of the blast wave. However, as noted in the above tabulations for the nodes shown in Figure 14, the shear forces developed as a result of a 10-ps: uniform static load decreased in magnitude from a maximum in the center portion of the wall to a minimum near the top and bottom supports; in particular, the shear forces at the nodes above the level of the door opening are much less than the maximum shear values. It is therefore reasonable to assume that under blast loading the one-way action wall without arching will have an effective span somewhat less than the total height of the base-Therefore, for this study, the effective wall height for ment wall.

for one-way action was assumed equal to the height of the door opening.

The collapse overpressure was obtained for walls with the following properties and load conditions:

A THE PARTY OF THE

 $L_{u} = 80 \text{ in.}$

 $L_u = 92 \text{ to } 360 \text{ in.}$

 $t_{..} = 8 \text{ in.}$

 $f'_{4c} = 3,750 \text{ psi}$

 $f_{dv} = 44,000 \text{ psi}$

 $p = 0.0015 A_c$ (vertical)

 $_{\vee}$ = 145 pcf

 $P_{..} = 0$

Support case: one-way propped cantilever

S = 6.7 ft

W = 1 Mt

The collapse of these basement walls is predicted to occur at a blast overpressure of approximately 4.5 psi for all wall widths from L₌ = 92 in to 360 in. For comparison, the collapse overpressure was also obtained for a 12-in.-thick reinforced concrete basement wall with the same properties as for the above 8-in. wall. The predicted collapse overpressure for the 12-in.-thick wall was found to be 9.2 psi for the same range of wall widths.

One-Way Concrete Wall (With Arching)

For a frame structure, it is possible that one-way arching, rather than one-way flexure, may occur in the basement wall subsequent to a shear failure at the basement/areaway wall construction joint. Therefore, calculations were performed to determine the blast strength of one-way arching walls. Since arching walls develop considerable more resistance than similar nonarching walls, it was felt to be more meaningful to use

the full height of arching walls in the analysis, rather than the height of the door opening as was done for nonarching walls. The collapse overpressure was obtained for a wall with the following properties and load conditions:

 $L_{,} = 120 in.$

 $L_1 = 92 \text{ to } 360 \text{ in.}$

 $t_{...} = 8 in.$

f' = 3,750 psi

 \cdot = 1.15 pcf

Support case: one-way arching

S = 6.7 ft.

W = 1 Mt

The collapse of these basement walls is predicted to increase from a blast overpressure level of 6.9 psi for $L_{\mu} = 92$ in. to 10.1 psi for $L_{\mu} = 360$ in. The results of the analyses for both the one-way concrete walls with arching and wathout arching are shown in Figure 15.

Summary and Discussion

The primary purpose of this effort was to examine the dynamic response of conventional reinforced concrete basement walls located in areaways, and determine if such walls can resist a 10-psi blast overpressure. Since an adequate analytical model for predicting the collapse of basement walls with door openings was not available, it was necessary to perform several types of analyses so as to make a realistic estimate of the collapse strength of the walls. To provide uniformity for the various analyses, a standard basement wall with door opening was designed in accordance with the 1963 ACI code for reinforced concrete.

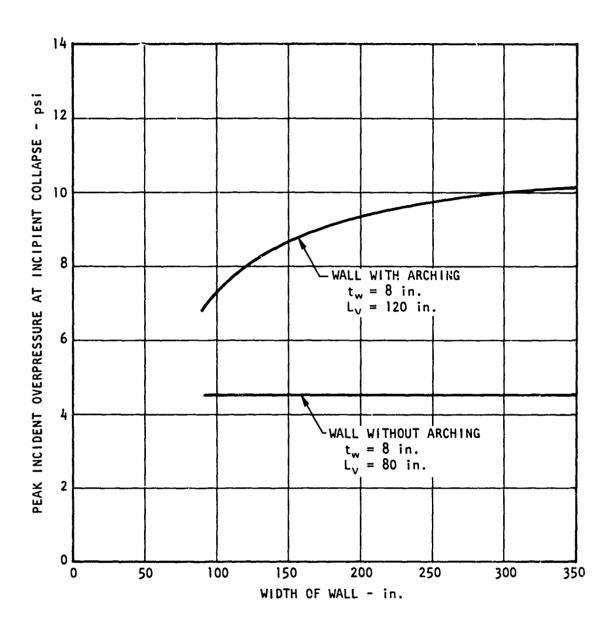


FIGURE 15 PEAK INCIDENT OVERPRESSURE AT INCIPIENT COLLAPSE VERSUS WALL WIDTH

One-Way Reinforced Concrete Basement Wall Without Arching One-Way Concrete Basement Wall With Arching

An initial static analysis was made to compare the flexural resistances of two-way reinforced concrete walls with and without door openings. The results of this analysis (Figure 10) indicated that the flexural resistances of the two walls shown in Figure 9 were approximately equivalent. It was therefore warranted to use an available computer program to perform dynamic analyses of walls without door openings, and then to use these results for estimating the collapse overpressure of basement walls with door openings. The predicted collapse overpressures for two-way walls without door openings are shown in Figure 11 for 8- and 12-in.-thick reinforced concrete walls with wall heights of 96 and 120 in.

However, although the results of this analysis appeared reasonable, there was some co ern because the available analytical model could not provide sufficient detailed information on the effect of the complex door opening geometry on the response of the wall. Therefore, an available static finite element computer program was used to analyze an 8-in.-thick two-way wall. The results for a 10-psi uniform lateral static load indicated that a shear failure was probable at the construction joint between the basement and areaway walls shown in Figure 12a. From the analysis of two walls with different widths, it was concluded that a shear failure would occur at relatively low overpressure levels if the areaway wall was located greater than abc 20-in, horizontal distance from the edge of the door opening. However, a shear failure in the basement wall at the basement/areaway wall joint does not necessarily result in collapse of the basement wall, since the wall may still resist the applied clast forces through one-way flexural or arching action between top and bottom supports subsequent to the shear failure and loss of side supports.

To determine the effect of a shear failure at the basement/areaway wall joint on the collapse strength of two-way walls, dynamic analyses

were performed for one-way basement walls, both with and without arching. The results of the analyses are indicated in Figure 15, where it can be noted that 8-in.-thick reinforced concrete basement walls without arching are predicted to collapse at less than 5-psi blast overpressure. Although the predicted collapse overpressure for arching walls is much greater than for nonarching walls, for most of the wall widths examined the strength of arching walls is less than the 10-psi blast overpressure criterion. It should be mentioned that these results apply to the minimum thickness reinforced concrete basement wall, which has the minimum area of steel reinforcement permitted by the 1963 ACI building code for reinforced concrete.

Conclusions

(Social military constitution in representation in a second measure of the second in t

From the various analyses performed, a few general conclusions can be made concerning the collapse of blast loaded reinforced concrete basement walls with door openings and located in areaways. First, for reinforced concrete walls 8-in. thick or thicker, and not over 10-ft high, it is probable that the wall strength of the weakest code-designed wall is sufficient to resist a 10-psi blast loading if the horizontal distance from the edge of the door opening to the areaway support wall is less than approximately 20 in. (L = 84 in.),

Second, for 8-in.-thick walls with horizontal distance between door opening and areaway wall greater than about 20 in., it will be necessary to strengthen the wall in the vicinity of the door opening so as to upgrade the wall to the 10-psi blast overpressure level.

Third, for reinforced concrete basement walls 12-in. thick or thicker, the blast strength can be expected to be approximately equal to or greater than the 10-psi blast overpressure criterion for all wall conditions.

Appendix A

LISTINGS OF COMPUTER PROGRAMS

Appendix A

LISTINGS OF COMPUTER PROGRAMS

Introduction

This appendix contains a printout of the listing for each program developed for DCPA for analyzing the dynamic response and collapse of walls and floor systems of existing buildings.

The programs were coded in FORTRAN and run on United Computing Systems, Inc., commercial time-sharing CDC 6400 computer (System UCS-VI); running on other systems may require minor modifications to the programs. For convenience and ease of use during the research effort, as well as by others later, the programs were written in an interactive or conversational mode.

To reduce the size of the computer central memory required, and thereby reduce the cost of running the programs, the Link Mode or chaining technique was used for the larger programs. Chaining has the advantage of reducing the overall cost of running programs, but a slightly more complicated technique is required to compile the programs in preparation for execution. Half of the programs were developed as chained programs.

Also included in this appendix are short summaries describing the function of each of the following eight programs:

- UNREINF, Unreinforced masonry wall without arching, see page 63
- · ARCHING, Unreinforced masonry wall with arching, see page 81
- RCWALL, Reinforced concrete wall, * see page 95

^{*} Link Mode or chained program.

- RCSLAB, Reinforced concrete slab, * see page 115
- RESTRAN, Restrained reinforced concrete lab, see page 133
- RCBEAM, Reinforced concrete support beam, * see page 147
- STBEAM, Steel support bean,* see page 165
- FLAT, Flat slab or flat plate, see page 181.

Following the summaries are the listings of the programs.

Summary of Computer Programs

Program UNREINF

Analyzes one-way and two-way unreinforced masonry walls (exterior or interior) without arching for a given load, or solves for incipient collapse load. Window openings may be included. Load types include: idealized blast loading (front, side, or rear face) with or without room filling; triangular load; rectangular load; URS tunnel loading; arbitrary load shape. Modulus of rupture and clearing distance may be randomly varied (normal distribution).

Subroutines: Main Routine COEF

FORCE TRANS
FILL WINDOW
RESIST RANDOM

Program ARCHING

Analyzes one-way and two-way unreinforced masonry walls (exterior or interior) with arching for a given load, or solves for incipient collapse load. Window openings may be included. Load types include idealized blast loading (front, side, or rear face) with or without room filling; triangular load; rectangular load; URS tunnel loading; arbitrary lead shape. Ultimate compressive strength, modulus of elasticity, and clearing distance may be randomly varied (normal distribution).

^{*} Link Mode or chained program.

Subroutines: Main Routine

RESIST

FORCE

WINDOW

FILL.

RANDOM

Program RCWALL

Analyzes one-way and two-way reinforced concrete walls (exterior or interior) for a given load, or solves for incipient collapse load. Windo repenings may be included. Load types include: idealized blast loading (front, side, or rear face) with or without room filling; arbitrary load shape. Lynamic yield strength of reinforcement steel and clearing distance may be randomly varied (normal distribution).

Subroutines: RCWALL1

RESIST

WINDOW

MOMENT

RCWALL2

COEF

FORCE FILL

TRANS RANDOM

Program RCSLAB

Analyzes one-way and two-way reinforced concrete floor slabs for a given load, or solves for incipient collapse load. Tensile membrane resistance may be included. Dynamic reactions may be output to a data file for use in analyzing support beams. Load types include: idealized blast loading (top face) with rise time equal to time required for blast wave to travel across short span; room filling pressure resulting from idealized blast loading; arbitrary load shape. Dynamic yield strength of reinforcement steel and clearing distance (for room filling load) may be randomly varied (normal distribution).

Subroutines:

RCSLAB1

RESIST

COEF

MOMENT

RCSLAB2

TRANS

FORCE

RANDOM

FILL

Program RESTRAN

the conference of the conference of

Analyzes two-way reinforced concrete floor slabs with edges restrained against lateral movement for a given load, or solves for incipient collapse load. Both compressive and tensile membrane behavior are included. Load types include: idealized blast loading (top face) with rise time equal to time required for blast wave to travel across short span; room filling pressure resulting from idealized blast loading; arbitrary load shape. Yield strength of reinforcement steel, concrete compressive strength, and clearing distance (for room filling load) may be randomly varied (normal distribution).

Subroutines: Main Routine

MOMENT

of the section of the

FORCE

TRANS

FILL

RANDOM

RESIST

Program RCBEAM

Analyzes reinforced concrete beams (rectangular or T-beam) for a given load, or solves for incipient collapse load. Tensile membrane resistance may be included. Load types include: dynamic reactions from slab analysis (see RCSLAB); idealized blast loading acting on beam and area of slab supported by the beam with rise time equal to time required for blast wave to travel length of the beam; room filling pressure resulting from idealized blast loading acting on beam and area of slab supported by the beam; arbitrary load shape. Dynamic yield strength of reinforcement steel and clearing distance (for room filling load) may be randomly varied (normal distribution).

Subroutines: RCBEAM1

RESIST

RCBEAM2

MOMENT

FORCE

COEF TRANS

FILL

RANDOM

Program STBEAM

Analyzes structural steel beam (wide flange may include bottom steel cover plate and/or composite action with slab) for a given load, or solves for incipient collapse load. Load types include: dynamic reactions from slab analysis (see RCSLAB); idealized tlast loading acting on beam and area of slab supported by the beam with rise time equal to time required for blast wave to travel length of the beam; room filling pressure resulting from idealized blast loading acting on beam and area of slab supported by the beam; arbitrary load shape. Dynamic yield strength of structural steel, dynamic yield strength of reinforcement steel (composite beam), and clearing distance (for room filling load) may be randomly varied (normal distribution).

Subroutines: STBEAM1 RESIST
STBEAM2 COEF
FORCE TRANS
FILL RANDOM

Program FLAT

Analyzes reinforced concrete flat slab floor system or flat plate floor system for a given load, or solves for incipient collapse load. Tensile membrane resistance may be included. Load types include: idealized blast load (top face) with rise time equal to the time required for blast wave to travel across span (slab assumed to be square); room filling pressure resulting from idealized blast loading; arbitrary load shape. Dynamic yield strength of reinforcement steel and clearing distance (for room filling load) may be randomly varied (normal distribution).

Subroutines: Main Routine RESIST FORCE MOMENT FILL RANDOM

UNREINF

Unreinforced Masonry Wall Without Arching

PROGRAM UNREINF

Photograph and the control of the co

```
01000 PR3GRAM JIMB3C(INPUT-3UTPUT-16PE1=JUTPUT)
01010C: THIS RBUTINE IS THE C3NTR3LLING RBUTINE FBR THE PR3GRAM USED
01020C: IN THE ANALYSIS OF DNE-WAY OF TW3-WAY ACTION WALLS.
01040
              COMMON Y(100), YU, YFAIL, D, DU, AREA, ZMASS, ZKLM, VH1, VH2, VV1, VV2
             COMMON (WALL, KINC, KRF, KRAND, I, ICASE, F), VFAIL, FR, FPM, EM, FDY COMMON FDC, D(4), LDTYPE, PEXT, PF, PS3, PD0, PC, TC, TO, P3, TIME, L, S
01050
01060
             C34M34 / RAND/ TIMEC, I WALL
DIMENSIAN ACTOO), VC(100), T(100), VV(100), VC(100)
01070
01030
01070+
                PEX(100), PIN(100), PN(100)
011000
011100:
           READ TITLE AND CONTROL PARAMETERS
             PRINT 67
01120 5
             READ 68. TITLE
01130
01140
             PRINT 95
01150
              READ, KWALL KINC, LDTYPE, KRF, KRAND
01160
             DELAY=0
01170
              VFAIL=1E10
             CALL RESIST(1)
CALL FARCE(1)
01180
01190
             1F(4RF.E7.0)GTT 12
01200
01210
             CALL FILL(PINT, 1)
01250 15
             IF( < WALL - EO - 0) G0 T0 14
01230
             PRINT 96
              READ. DELAY
01240
01250
             DELAY=DELAY/1000+0
01260 14
             IF( < RAND. NE. 1) GOTO 35
01270
             CALL FORCE(4)
01290
             CALL RANDSM(1)
01290 34
              CALL RANDOM(2)
01300 35
             CALL RESIST(3)
013100
DIBROC: MINIMIM, MAXIMUM, AND STARTING VALUES ARE DETERMINED FOR CASES
01330C: WHERE THE LOAD CAUSING INCIPIENT COLLAPSE IS TO BE FOUND
            IF(KINC-E0-0) 0919 23
01340 13
01350
              PFzOII
              PFMAX=0
01360
              PFMIN=PF/2.0
01370
01390
              G8T3 20
              PF#(PFMIN+PFMAX)/2.0
01390 16
01400 20
             CALL FORCE(2)
01410 23
             IF (4RF.E0.0) GOTO 24
01420
             CALL FILL (PINT. 2)
01430C
01440C: INITIALIZE VALUES FOR BETA METHOD (RETA . 1/6) AND COMPUTE VALU
01430C: FOR FIRST TIME INTERVAL ASSUMING WALL INITIALLY AT REST
              1=1
01460 24
01470
               TIME=0
01480
              T(1)=0$ V(1)=0$ Y(1)=0
01490
               DEL T4=0.001
             IF((WALL.E).0) G3T3 29
IF(TIME.GE.(DELAY-0.00001)) G3T3 29
TIME=TIME+DELTA
01520
01530 27
01540
01550
              CALL FILL (PINT, 3)
              G3T8 27
01560
01570 25
             D)A(1)=b1A1
01590
              TPVET=AREA*PINT
01590
              T(1)=TIME
             GATA 30
CA'L FARCE(3)
01600
01610 29
              PEX(I)*PEXT
01615
01620
              TPVET=AREA.PEXT
01630
               PY(1)=PEXT
01640 30
              CALL RESIST(2)
               A(1)=TPNET/(7MASS#44LM)
01650
               VV(1)=VV1+TPNET
01660
               VH(1)=VH1+TPVET
01670
01680C
O1690C: PROCEDURE FOR ALL SUBSEQUENT TIME INTERVALS
01700 1
01710
              IF(1.LT.101)G3T3 11
01720
             PRINT 98. TIME
             FORMAT(/, 01=101) TIME =0.F6.3.01 WALL ASSUMED TO NOT FAIL 0)
01730
        95
01740
              98 T8 6
```

and the same assertant and a second and an article of the second of the same and a second of the sec

```
01750 11
            TIME=TIME+DELTA
01760
              T(I)=TIME
01770
              1(1)=A(1-1)
01780
            . L F3RC5(3)
              FEX(I)=PFKT
01790
            IFCKWALL-EQ-1)GFT8 10
01800
01910
            IF(4RF. 69.9) 0913 3
01320
            CALL FILL (PINT, 3)
01930
             PIN(I)=PINT
01840
             TPVET=AREA*(PEX1-PINT)
01550
              G3T3 2
01860 3
              TPVET=AREA*PEXT
            G9T3 2
CALL FILL(PINT.3)
01870
01880 10
01690
            PIV(I)=PIVT
01900
            TPVET=AREA*PINT
01910 2
            PN(I)=TPNET/AREA
01920
             D8 8 JJ=1.10
01930
              Y(I)=Y(I-1)+DELTA+V(I-1)+DELTA+DELTA+(A(I-1)/3+A(I)/6.)
01940
             CALL RESIST(2)
01950
01960 4
              ANEX=(TPNET-)T)/(Z415545(L4)
21972
              ADELTA: AVEW-ACL)
01730
              4(()=44Ew
01935 [F(ANEW-E0-0)PRINT, #1945#+ F[48- FP48F+7F+24455+74L4+7([)+4([-1)
01990
            1F(4RS(40F,T4/(44Ew+1+05-10))+L[-0+01)G)[1 4
05333 R
             CHALINE
03010
              4(1)=4154-405, [4/2.0
              WRITECIARDITIMEAPEACTIAYCE
12121
05033 ¥
             CHALLAGE
02343
             Y([]=Y([-1]+05L[A+y([-1]+)5L[A+05L[A+(A([-1]/3.+A([)/6.)
12051
              V([]=V([-1)+95LT4+(3([)+3([-1))/2+9
12741
              1C+5/V+15/41+1/V=(1)/V
02070
              1C#SFV+12F61#1FV=(1)FV
02290
            IF(VV(I).G[.VFAIL)GT[) 7
050400
021000: CHECK FOR MAKEMUM DEPLECTION OR FAILURE OF WALL
           IF MAKIMUM DEFLECTION REACHED, WALL DID NOT FAIL
0511001
02120
            1F(Y([).LE.Y([-1).AND.PN([).LE.PN([-1))57[7 6
             IF(Y(1)-LT-0)6313 6
0: 33
            S00-0=A1 J30 (C10-0-20-YAJ30-2417) 31
            IFCYCLD+LT+YJ)G171 I
            1F(T146-DELAY-GE-0-020)DELTA=0-005
.. . . . . .
02170
            1F( TIME-DELAY. GE. 0. 100) DEL FA=0.010
22190
             IF(T145-96LAY. GE. 9. 50 3) USL [4=0.050
021400
          IF FAIL IRE DEFLECTION REACHED. WALL FAILED
            IF(Y(I).GE.YFAIL)GTTT 7
02200
02210
055500
02230C: INTERVAL HALVING PRICEDURE TO DETERMINE LIAD CAUSING INCIPIENT 02240C: COLLAPSE FOR CASES WHERE DESIRED 02250C: WALL DID NOT FAIL - SET PEMIN TO PE
08260 6
            CONTINUE
02277
             15(KRAND-52-1)6717 36
02280
             IF(<!NC+50+0)63T3 19
22270 36
            3541 4= DE
              [F(PF4A(.GT.0)G)T) 17
02390
             PF=2.04PF
02310
08380
              6313 20
            WALL FAILFO - SET PERAK TO PE
13003
12347 7
            CHITTAIR
りとろうつ
             TIMEC=TIME
02360
             IF(<2440.67.1)6313 37
            1F(<1NC-£3-0) 63 F3 18
02370
02389 37
             PF444=PF
023900:
           CHECK TH SEE IF LBAD RANGE IS WITHIN DESIRED ACCURACY
02- 7 17
             TENTPENAN-PERLINDPENTINGET-0-011GRED 16
02410
             IFC4440+4E+11G1T3 14
02420
            CALL RAND34(3)
02430
            G3T3 34
024400
02450C: 3 ITP:// DATA (NOLIDES THE MAKIMUM DEFLECTION AND THE 3F 02460C: DCCIRANCE FOR A NON-FAILING WALL OR THE 114E AND VELOCITY DRAFTC: AT COLLARSE FOR A FAILING WALL. PYTONAL DIJEPIT IS THE
```

A CONTRACTOR OF THE PARTY OF TH

Management of the second of th

American State of State

```
OZ490C: ENTIRE REHAVIOR TIME-HISTORY OF THE WALL.
22490C
02500C: SUTPUT LIAD NATA
72517 19
02520C
             CALL FIRCE(4)
02530C: BUTPUT FINAL RESILTS
             IF(Y(I).LT.YFAIL)WRITE(1,70)Y(I),T(I)
02540
02550
             IFCYCLL.GE.YFAIL)WRITE(1.71)TCLL,VCL)
02570C: CHECK THISEE IF ENTIRE TIME-HISTORY OF WALL IS DESIRED
92530
             WRITE(1.72)
02530 9540.4
             1F(4.52.0)(3)[3 25
02600
02620
            IF( (WALL . EQ. 1) GTT1 32
            IF(4RF+E2+0)G1T1 26
02630
02640
             WRITE(1,75)(T(3),PER(1),PIN(3),PN(3),Y(3),VV(3),VH(3),J=1,I)
             G3T3 25
WRITE(1,75)(T(1),PEY(1),A(1),V(1),Y(1),VV(1),VH(1), J=1,1)
02650
02660 25
02670
            G3 T3 25
            WRITE(1, 76)(T()),PIN()),A()),V()),Y()),VV()),VH()), I=1,1)
02690 32
02490 25
             WRITE(1,77)
02700
             6777 5
027100
02720 47 F3R44T(/4INPHT TITLE***)
02730 69 F3R4AT(459)
02740 TO FERNATC/ WALL DID NET FAIL - MAY. DEFLECTION SPAFE.?
02750 * IN. REACHED AT*F7.3.* SEC (FINAL VEL3CITY =*
02770+ F7-2* 14-/SEC)*)
02770+ F7-2* 14-/SEC)*)
02770+ F7-2* 14-/SEC)*)
02800 75 FARMATC/. 154. *PRESSIAE 34 WALL */* TIME
                                                         EXTERISA .
02410+ *INTERIAR
                     VET
                              DISPLACEMENT
          (F6.3.3F10.3.F12.4.F11.0.FR.0))
02930 76 F3RMATC/* TI45 PRESSURE ACCELERATION VELOCITY *
02940+ *DISPLACEMENT VV VH*/
         (F6.3, F9.3, F12.1, F12.2, F12.4, F11.0, F8.0))
02550+
             F3R44T(///,7(+-----4))
02860 77
02970 90 F394ATC/+ACCELERATION NOT CONVERGING AT TIME =+.F6.3.
405850
                 * SEC (PF =*, F7.3. * PS[)*/*
                                                      ACTO SET EDUAL TOW.
                  FR-1.* (AVG 3F LAST & TERATIANS)*/*
40520
                                                                Y(1) =4.
                 FR. 4. . I N. . 1
02400+
02910 95 F3RMATC/#EMPHT (WALLCO=EXT+1=EMT)+(IMC+LOTYPF+CRF+CRAND#+
02920+
          *(1=744034)*)
02930 86 FRRATC/ ELIPST DELAY TIME (MSEC) TO INITIAL LOADING AFE.
02940+
          * INTERIOR WALL ...
029500
25443 444
             5130
           END
02970
10000 SUBROUTINE FORCE(LENTRY)
10010C THIS SUBRAUTINE INPUTS THE LAAD PARAMETERS AND DETERMINES 10020C THE LOAD AT A GIVEN TIME FOR THE FOLLOWING LOAD TYPES:
         THE LOAD AT A GIVEN TIME FOR THE FOLLOWING LOAD TYPES:
10030C
            1. IDEALIZED BLAST LOAD (FRENT OR SIDE FACE)
100800
10090 C3MM3N Y(100).YU.YFAIL.9.QU.AREA.ZMASS.ZKLM.VM1.VH2.VV1.VV2
10100 C3MM3N KWALL.KINC.KRF.KRAND.1.ICASE.FU.VFAIL.FR.FPM.EM.FDY
10110 C3MM3N FDC.D(4).LDTYPE.P.PR.PS3.PD3.PC.TC.TO.P3.TIME.LL.S
10140C
10150 G3T3(100,200,300,4), [ENTRY
10160C
10170C INPUT LEAD PARAMETERS
10190 100 1F(KRAND-E9-0) GOTE 102
10192 W=1000 $ P3=14.7 $ C9=1120.0 $ LaC=1
10194 RETURN
10196 102 PRINT 600
10200 READ, W. PO. CO.1.0C.5
10210 IF(L3C+EG+1)G3T3 105
10220 PRINT 605
10230 READ. ZLEN. CD
:0240 105 IF(KINC-52-1)RETURN
10256 PRINT 630
10260 READ, PS2
10270 PR=2.0=PS9=(7.0=P3+4.0=P58)/(7.0=P3+P58)
10250 GOTO 215
```

11000C

Definition of the second desired and the second desired desired and the second desired desi

```
110100 CALCULATE LAAD PRAPERTIES FOR GIVEN PEAK PRESSURE
11030 200 G3T3(205.210).L3C
11040 205 PS0=(PR-14.0*P3+S2RT(196.0*P3*P3+196.0*P3*PR+PR*PR))/16.0
11050 GATA 215
11060 210 PS9=PR
11070 215 PD9=2.5*PS9*PS9/(7.0*P3+PS))
11080 U=C3+SQRT(1.0+(6.0+PS3)/(7.0+P3))
11090 T0=W**0.3337/(2.2399+0.1996*P53)
11100 G3T3(220,'
                      . ac
11110 220 TC=3.0+
11120 PC=PS3*(1-TC/Tu.~EXP(-TC/T0)+P03*(1-TC/T0)**2*EXP(-2*TC/T0)
11130 CD=1.0
11140 RETURN
11150 225 TA=ZLEN/U
11160 TA2=TA/2+0
11170 TA2TO=TA2/TO
11180 PA=PS3*(1-TA2T0)*EXP(-TA2T0)*CD=PD3*(1-TA2T0)**2*FXP(-2*TA2T0)
11190 RETURN
12000C
12010C CALCULATE LIAD
12030 300 GT3(305,310),L2C
12040 305 TTO=TIME/TO
12050 IF(TIME-GT-TC) G3T3 320
12060 P=PC+(TC-TIME)+(PR-PC)/TC
12070 RETURN
120R0 310 TTO=(TIME-TA2)/TO
12090 IF(TIME.GT.TA) 03T3 320
12100 P=PA+TIME/TA
12110 RETURN
12120 320 IF(TTO.GE.1.3) G3T8 330
12130 P=P50*([-TT0)*EXP(-TT0)+CD*PD0*(1-TT0)**2*EXP(-2*TT0)
12150 RETURN
12160 330 P=0
12170 RETURN
13000C
13010C PRINT LOAD DATA
13020 4 IF(KINC.E).0) G3T3 400
13030 PRINT 640. LDTYPE
13040 GOTO 410
13050 400 PRINT 645, LDTYPF
13060 410 CONTINUE
13070 415 G3T3(420,425),L3C
13080 420 PRINT 650
13090 GTT9 430
13100 425 PRINT 655
13110 430 PRINT 660, W. P3. C3
13120 IF(KRAND-NE-0)RETURN
13130 G0T3(435,440),L3C
13140 435 PRINT 665. S. TC. P4
13150 G7T7 445
13160 440 PRINT 670-ZLEN-TA-PA
13170 445 PRINT 675-U-TO-CD-PS3-PD3
13180 RETURN
1 4000C
14010 600 FØRMAT(/*INPUT W.P3.C3.L3C.S***)
14020 6C5 FØRMAT(/*INPUT L.CD***)
1 4060 630 F3RMAT(/+[NPIJT PS8+++)
14070 640 FARMATC/+LOAD CAUSING INCIPIENT FAILURE IS AS FOLLOWS: ..
14071+
           1.5x. +L3AD TYPE VIMBER+. 12)
14080 645 FORMAT(/*PROPERTIES OF LOAD ACTING ON WALL ARE AS FOLLOWS: *.
14081* /. SX.*LOAD TYPE NIMBER*, [2]
14090 650 FORMAT(BX.*(FRONT FACE)*)
14100 655 FTRMAT(RY. +(SIDE FACE)+)
14110 660 FORMATCIOX, *W **, F9.1, * 4T
                                           P3 =*. F6.2. * PSI
14111+
           F7-1.* FPS+)
14120 665 FØRMATC10X.*S **.F6.1.* FT
                                              TC **. F6.3.* SEC
14121+
           F7.3, * PSI *)
14130 670 FORMATCION. . . . F6.1. FT
                                              TA =*, F5.3, * SEC
14131+
           F7.3. * PS[ *)
14140 675 FORMATCIOX, +1 =+. F7.1, + FPS
                                             TO =*. F6.3. * SEC
                                                                     CD = .
14141+
           F5-1-/-8X-+P58 =+.F7-3.+ PSI
                                             PB8 =*, F7.3, * PS1+)
15000 END
```

The property of the second of the second

... western

```
20000 SIBROUTINE FILL(P3.IENTRY)
20010C1 TOMPUTES AVERAGE AIR PRESSURE IN ROOM DUE TO BLAST WAVE 20020C1 LNCIDENT HEAD-ON UPON FRONT WALL.
20030C
20040 C3MM3N Y(100), YU, YFAIL, 3, QU, AREA, ZMASS, ZKLM, VH1, VH2, VV1, VV2
20060 COMMON KWALL, KINC, KRF, KRAND, II, I CASE, FU, VFAIL, FR, FPM, EM, FDY
20070 COMMON FOC. D(4).LUTYPE.PEXT.PR.PSO.PDO.PC.TC.TO.PO.TIME.L.S
(R) VV. (S.P) AA (9,2), NY(R)
20090 L76[CAL L1.L2.L3
20100 G0T9(10.13.11). IENTRY
20110 10 PRINT 700
20115 RH00=0.076 $ L1=.FALSE.
20120 READ, NWI N. V3
20125 AT=0$ AFRONT=0$ ASIDE=0
20130 DØ 18 I=1, VWIN
20140 PRINT 710, I
20150 READ, AA(I, 1), NN(I), AA(I, 2)
20160 AA(1,2)=AA(1,2)/1000.0
20161 AT=AT+AA(1,1)
20162 M=NY(I)$ G8T8(12,14,14),4
20163 12 AFR&NT=AFR&NT+AA(1,1)
20164 G373 1K
20165 14 ASIDE=ASIDE+R4(I+1)
20170 19 C3NTINUE
20175 AFRONT=AFRONT/ATS ASIDE=ASIDE/AT
20180 700 FORMAT(/*INPUT NWIN AND ROOM VOLUME (CF)*,+)
20200 7:0 FORMAT(/*INPUT AREA (SO FT),LOCATION CODE & DELAY(MSEC)*
20210+ * FOR WINDOW+, 12,+)
20230 G=1.4 $ G2=1./G $ G3=1.-G2 $ G4=2./G3 $ G5=G+1.
20240 G6=2. G/G5 $ G7=(G-1.)/G5
20250 PP2=.1912
20260 C=SQRT(Q+P0+32.+144./RH83)
20270 TAU=2.*(V3**(1./3.))/C
20280 NSTEP=4
20290 DT=TAU/NSTEP
20300 RETURN
20310C
20320 13 P30=P0
20330 TT=0.$ T9=0.
20340 RH938=RH98
20350 L2=.FALSE. $ L3=.FALSE.
20360 RETURN
20370C
20380 11 IF(L1) G0T0 52
20385 IF(L2.A.L3) 00T8 9
2039G 52 DDT=(TIME-Ta)+0.5
20395 IST8P=2
20400 53 IF(DDT+LT+DT) G3T3 51
20410 50 DDT=0+5+DDT
20415 ISTOP=2+1STOP
20420 G3 T3 53
20430 51 CONTINUE
20440 D0 99 [=1,15T9P
20450 TT=TØ+1*00T
20460 [F(TT-GT-TD)63 T9 99
20470 DM=0. $ WH=0. $ NH=0
20480 DO 500 K=1. WIN
20490 4=44(K) $ DLY=A4(4,2)+0.00001
20500 IF(DLY-GE-TT) 60 T9 500
20510 G8T8(15,16,16),4
20520 15 CDF=1.0
20530 IF(TT-TC)20,20,21
20540 20 PI1=(TC-TT)+(PR-PC)/TC+PC
20550 P11=P11+P0
20580 G9 T3 30
20570 16 CDF=-0-4
20600 21 R=TT/TO $ RR=1.-R
20610 PD=PDG+RR+RR+EXP(-2.4R)
20620 PS=PS@@RR#EXP(-R)
20630 P11=PS+CDF+PD
20640 P11=P11+P4
20650 30 RH81=RH88+((Pi1/P8)++G2)
20660 IF(P11-P39)36,36,37
```

20670 36 JSI (N=-1

```
20680 L2=. TRUE.
20770 303 P2=P11
20780 RH32=((P2/P33)++G2)+RH333
20790 X#P38/RH938
20800 GJ TJ 38
20810 37 JSIGN=+1
20820 306 P2=PP2=P11
20930 RH92*((P2/P11)**G2)*RH01
20840 X=P11/RH31
20650 39 U22=G4+(X-P2/RH02)+32.+144.
20860 IF(U22)40,39,39
20870 40 PRINT * 1122 NEGATIVE * , U22
20880 STRP
20890 39 U2=SQRT(U22)+J51GV
TGG + (1.7) AA + SOHR + SU = PGG 0000
20910 D4=04+DD4
20920 WW= WW+ P11+DD4/(G3+R431)
20930 500 CONTINUE
20940 P30=P30+(G-1.)+WW/V3
20950 RH030=RH030+D4/V3
20960 99 CONTINUE
20970 T8=TT
20990 P3=P38-P3
20982 IF(TIME.GE.TC)L3=.TRUE.
20983 RETURN
20984 9 R=TIME/TO $ RR=1.0-R
20985 PD=PD0+RR+RR+EXP(-2.0+R)
20985 PS=PS9*RR*EXP(-R)
20987 P3=PS+PD+(AFR3NT-0-4*ASIDE)
20990 999 RETURY
S1050 EAD
30000 SUBROUTINE RESIST (IENTRY)
300100
          THIS SUBROUTING DETERMINES THE RESISTANCE FUNCTION FOR AN UNREINFORCED MASONRY WALL WITH OR WITHOUT OPENINGS. CASES 1-4 ARE TWO-WAY WALLS AND CASES 5-7 ARE ONE-WAY WALLS
300200:
30030C:
30040C:
30060 CAMMAN Y(100), YIJ, YFAIL, Q, OU, ARER, ZMASS, ZKLM, VH1, VH2, VV1, VV2
30070 COMMON KWALL, KINC, KRF, KRAID, I, ICASE, FU, VFAIL, FR, FPM, EM, FDY
30080 CAMMON FOC. D(4).LOTYPE. PEXT. PF. PSA. PDJ. PC. TC. TO. PO. TIME.L. S
30110C
30120 G3T3(5,500,262), IENTRY
30130C
30140C: INPUT WALL PARAMETERS
30150 5 WRITE(1,600)
30160 READ, ZLV, ZLM, TW, PV, E, FR, ICASE, ZLVW, ZLM W, GAMMA
30170 WRITE(1.670)
30190C: DETERMINE SLASTIC DEFLECTION AND MAMENT CAEFFICIENTS FOR
30200C: TW3-WAY WALLS WITHOUT INPLANE FORCES
30205 [WALL=1
30210 R=7LH/2LV
30220 ALP=1.0/4$ ALP2=ALP+ALP
30233 IF(ICASE+LE-4) G3T3 11
30240 REDS ALPEOS ALP2=0
30250 11 AWALL=?LV+?LY
30260 AWI V=ZLVW+ZLHW
30270 AREA=AWALL-AWIN
30290 24455=6444448E4+TW/(396-07+1728-0)
30290 9=0-5+(ALP+59FT(3-0+ALP2)-ALP2)
30300 1G=TH++3/12+0
30310 CALL COEF (ICASE, R. ASS, ASS, AF, AF, IG, ZLV, ZLH, PV, NX, CF, E, 1)
30320 CALL TRANS (B. ZL V. TILH. I CASE, O. ZKLM. ZKLMSE, ZKLMFF. ZKLMP. VHIS.
30330+
         VH25, VV15, VV25, V41F, V42F, VV1F, VV2F, V41P, V42P, VV1P, VV2P)
30349C
30350C: DETERMINE MADIFICATION FACTOR FOR WALL WITH WINDOWS
30360C
30370 290 24ULT=1+0
30390 IF(AHIN. NE-O) CALL WINDOW COMULTIZENIZENIZEN WEZEM WANINIA WALLI
            R. (CASE)
30390 WRITE(1,620)ICASE, ZLV, ZLH, ALP, TWFR, E, PV, GAMMA, ZLVW, ZLHW OM LT
```

THE RESIDENCE OF THE PROPERTY OF THE PROPERTY

SECTION OF THE STA

```
30410 RETURN
30420C
         DETERMINE MAXIMUM RESISTANCE DURING DECAYING PHASE
30430C:
30450 262 MM=(FR+PV/TW)+TW+TW/6.0
30460 W=7LV+TW+GAMM4/1728.0
30470 IF(ICASE-GT-4) 9718 279
30480 QEZER0=12+0+TW+(2+0+PV+W)+(1+0+0+5+ALP2/B)/(ZLV+ZLV+(3-2+B))
30490 GST# 279
30500 278 2EZER8=8.0*T w=(PV+0.25*W)/(ZLV+ZLV)
30510 279 CONTINUE
30520 YFAIL=TW
30530 KEG=GEZERØ/TW
30540C
30550C: DETERMINE MAXIMUM RESISTANCE DURING INITIAL (FLEXURAL) PHASE
30560 9U=MM/(BSS+ZLV+ZLV)
30570 4S=E+16/(ASS+ZLV++4)
30590 YU=QU/KS
30590 IF(ICASE-EQ-1-0R-ICASE-EQ-5) G0T0 280
30600C
30510C: CASES 2.3.4
30629 Q1=44/(BF#ZLV#ZLV)
30630 KF=E+1G/(AF+ZLV++4)
30640 Y1=01/KF
30650 KEP=(QU-Q1)/(YU-Y1)
30660 GOTO 280
30670C
30680C: DETERMINE WHETHER BENDING OR EQUILIBRIUM RESISTANCE IS LARGER
30690C
30700 280 IF(QU-LE-QEZER8)G3T8 285
30710C
307200:
        QU>QEZER3
30730 Y2=YU
30740 92=9EZER#*(1.0-YIJ/TW)
30750 GOTO 295
30760C
30770C: @EZER3>98
30780 285 Y2=QEZERØ/(45+4E0)
30790 Q2=45+Y2
30800 295 CANTINUE
30510C
30820C: MODIFY RESISTANCE VALUES BY APPROPRIATE FACTOR
30830 310 91=01+9#ULT
30540 92=92*94ULT
30850 2U=9U+94ULT
30860 KS=KS=9MULTS KF=KF+0MULTS KEP=KEP+0MULTS KE0=KE0+0MULT
305 70C
30880C: OUTPUT LOAD-DEFLECTION CURVE
30890 IF(4RAND-E9-1)@170 325
30900 PRINT 650
30910 IF(ICASE-EQ-1-8R-ICASE-EQ-5) 0910 320
30920 WRITE(1,660)91.YI
30730 320 XXXXX=0.0
30940 WRITE(1,660)QU,YIJ,Q2,Y2,XXXXX,YFAIL
30950 325 RETIJRN
309600
30970C: DETERMINE THE RESISTANCE (PER UNIT AREA) OF THE WALL AS
30990C:
         A FINCTION OF Y(1)
31000 500 IF(Y(I).GT.Y2)G3T9 520
 .1005 IF(Y(I).GT.YU)@T# 502
31010 G8T3(502,510,510,510,502,510,510), ICASE
31020C
        ELASTIC: PHASE -- CASE !
31030C:
31040 502 G=Y(1)+KS
31050 505 ZKLM=ZKL4SE
31060 VH1=VH1S$ VH2=VH2S
31070 VV1=VV15$ VV2=VV25
31080 RETURN
310900
31100 510 IF(Y(1).GT.Y1)G3T2 515
31110C
31150C1
         ELASTIC PHASE -- CASES 2+3+4
31130 9=Y(1)*KF
```

```
31140 ZKLM=ZKLMFE
31150 VHI=VHIFS VH2=VH2F
31160 VV1=VV:F$ VV2=VV2F
31170 RETURY
311800
31190C: *ELASTO-PLASTIC* PHASE (CASES 2,3,4)
31200 515 0=01+(EP+(Y(1)-Y1)
31210 6073 505
31220C
31230C:
         SECONDARY (EQUILIBRIUM) PHASE
31240 520 IF(Y(1) - GT - TW) G3T3 525
31250 9=(E9=(TW-Y([))
31260 KL4=KKL4P
31270 VH1=VH1P$ VH2=VH2P
31280 VVI=VVIP$ VV2=VV2P
31290 RETURY
31300C
31310C:
          WALL COLLAPSED -- NO RESISTANCE (TO AVOID DIFFICULTIES
313200:
        FOR CERTAIN CASES SET RESISTANCE EQUAL TO VERY SMALL VALUE)
31330 525 0=1E-10
31340 RETURN
31350C
31360C
C1370 600 FORMAT(/*INPUT LV.LH.TW.PV.E.TR.ICASE.LV.LHW GAMMA*)
31390 620 FRYMATC/*WALL PROPERTIES -- SUPPORT TYPE NJ.*. [2/
31390+ * LV **.F6.1.* [N. LH =*.F6.1.* [N. LV/LH =*.
                                  LH =*, F6.1, TN. LV/LH =*,
FR =*, F7.1, * PSI*, SY,
31400+ F7.2/4 TW =#.F6.1;4 IN. FR =#.F7.1;4 PS[4, 31410+ # E =#.F10.1;4 PS[4/4 PV =#.F6.1;4 LR/IN.4,5%, 31420+ #GAMMA =#.F6.1;4 PCF4,/;4 LVW =#.F6.1;4 IN.
31425+ F6.1,* IV.
                     9418.T = * . F6. 3)
31430 650 FORMAT(/+LBAD-DEFLECTION CURVE+,/, 3x,+0 (PSI)+,4x,+Y (IN.)+)
31450 650 F3RMAT(F9.2, F12.4)
31460 670 F3RMAT(1H )
31480C
31490 END
40000 SUBROUTINE COEFCICASE, R. ASS, RSS, AF, BF, I, ZL V. ZLM. PV. NX, CF.
40010+
           E. I ENTRY)
40020Ct
          THIS SUBROUTINE DETERMINES MOMENT AND DEFLECTION COEFFICIENTS
40030C:
          FOR ONE-WAY (CASES 5-7) AND TWO-WAY (CASES 1-4) WALLS
40040C
40050
            REAL I.MOR, MPRSO, NIJ
40060
            IF(IENTRY-EQ-2)43T3 200
40070
            VX=1
40090
             IF(1CASE- GT- 4) G3T3 50
49090C
40100
             92=9#R
40110
40120
             R4= R2 e R2
40130
             ASS=-+007030++013990+R-+003456+R2++000286+R3
40140
              BSS=-+058332++139314+R++035609+R2++003016+R3
40150 B
             G0 T0 (41, 20, 30, 40), ICASE
40160C
401 70C:
          CASE 2. FIXED IN FOUR SIDES
40150 20
            C=XF
40190
             AF=-.003430+.007327*R-.003365*R2+.0006646*R3-.00004766*R4
40200
             BF=-.101150+.250975+R-.138992+R2+.034677+R3-.004016+R4
40210+
          ++100170+9++5
            CF=-.1674+.3554+R-.1714+R2+.02R6+R3
40220
40230
              G3T3 41
40240C
40250C:
          CASE 3. FIXED ON SHORT SIDES, SIMPLY SUPPORTED ON LONG SIDES
40260 30
             4X=4
             AF=+004513--017525+P+-023095+R2--010325+R3+-002187+R4
40270
40250+
         -.0002208*R**5 + .000009409*R**6
40290
            RF=--122149+-313445*R--153979+R2+-036172*R3--004015*R4
40300+
         +.0001646*R**5
40310
            CF=2-1959-7-7564+4+10-8376+42-7-2495+R3+2-344+R4
40320+
                -.29544R++5
             CRT9 41
40330
40340C
40350Ct
        CASE 4. SIMPLY SUPPORTED ON SHORT SIDES. FIXED ON LONG SIDES
40360 40
            VX=3
40370
             4F=-.002765+.008652+H-.005695+R2+.001529+R3-.0002R59+R4
         +.00001739*R**5
40380+
```

The second of the second of the second

```
40390
             BF=-.060320+.256515+R-.175648+R2: C57928+R3-.009227+R4
40400+
         ++000569*R**5
40410 CF=5.8987*R-1.6669-7.9398*R2+5.3142*R3-1.7623*R4+.2313*R**5
40420C
40430 41
            IF(R.GT.2.0)CF=1.0/12.0
40440
            IF(PV-EQ-O)RETURN
40450
            ARATIO=AF/ASS$ BRATIO=BF/855
40460
            BF0=BFS CF0=CF
40470
            G9T9 220
40480C
40490 50 IF(PV-NE-0) 0010 300
405000: CASE 5- 0NE-WAY SIMPLY SUPPORTED WALL
            ASS=5.0/384.0
40510
40520
             955=0-125
40530
             GOT3(270:270.270.270.270.60.70).ICASE
40540C
40550C:
        CASE 6. BNE-WAY FIXED END WALL
40560 60
             AF=1.0/384.0
40570
             BF=1.0/12.0
40580
            CF=1-0/12-0
40590
            E=XF
            RETURN
40600
40610C
40620C:
         CASE 7. ONE-WAY PROPERPED CANTILEVER WALL
40630 70
            AF=1.0/185.0
             BF=0.125
40640
            CF=0-125
40650
40660
            1X=3
40670
            RETURN
40680C
40690 200 IF(ICASE-GT-4) GDTD 300
40700C: DETERMINE ELASTIC DEFLECTION AND MOMENT COEFFICIENT FOR
40710C: TWO-WAY WALL WITH INPLANE FORCES
40720 220 PI=3-14159165
40730
             4U=0.3
40 740
            PE=4.0+PI+PI+E+I/(ZLV+ZLV+(1.0-4U+VIJ))
40750
             BV=0
40760 230
             AV=0
40770
             PPE=PV/PE
40.780
             TERM6=4.00PI*PI*R*SQRT(PPE)
40 79 05
40800C:
         SERIES SOLUTION USED TO DETERMINE COEFFICIENTS
             D9 250 4=1.7.2
40810
40520
40830
             4PRS3#4PR**2
40840
             G45G=4PRSQ+2.0+4PR4PI+59RT(PPE)
40850
             EMSQ#MPRSQ+2.0#MPR*PI*SQRT(PPE)
40560
             TERMS-MAMPRSQ=(MPRSQ-4.0=PI=PI=PPE)
             C3SHON2=0.5+(EXP(0.5+SQRT(OMSQ))+EXP(-0.5+SQRT(OMSQ)))
408 70
             IF(E459-LT-0) 0070 240
46660
             C3SHEM2*0.5*(EXP(0.5*SQRT(EMSQ))*EXP(-0.5*SQRT(EMSQ)))
40590
40900
             G3 T3 245
40910 240
             C05HE42=C35(0.5+5QRT(-5450))
40920 245
             Av=Av+(1.0+(E453/C35HG42-G459/C35HE42)/(4+TER46))
40930+
        +(-1)++((M-1)/2)/TER45
             BV=BV+(MPRSO+( GMSQ+(NU+EMSQ-MPRSQ)/CBSHEM2-EMSQ+(NU+GMSQ
40940
               -MPRSQ1/CaSHGM2)/(M+TERM6))+(-1)++((M-1)/2)/TERMS
40950+
40960 250
             CONTINUE
409 70C
40950Ct
          CASE 1
40990
            AVS5#AV#(1.0-YU#YU)#R4#4.0/PI
41000
             BVSS=BV=R2=4.0/PI
41010
             IF(ICASE-EQ-1) 0073 260
41 020C
41030C:
          CASCU 2. 3. AND 4
41040
            AVF-AVSS-ARATI &
41050
            BVF=BVSS+BRATI
41060
            CF=CF8+BVF/RF8
41070 259
            AF=AVF
41090
             BF-BVF
41090 260
          ASS=AVSS
41100
             BSS-9VSS
41110 270
            RETURN
```

and the state of t

SHEMPHONE VALUE OF THE PARTY

ter experience and the second of the second contract of the second contract of the second of the sec

```
4 1200
41130C: 3NE-WAY WALLS
41140 300 EIPV=E*I/PV
            U=ZLV/SORT(ELPV)
41150
41160
            12=0.5+U
            TERM1=1.0/CAS(U2)-1.0
41170
41180C
41190%:
         CASE 5. ONE-WAY SIMPLY SUPPORTED WALL
41200
            BSS=TERM:/U**2
41210
            ASS=(BSS-0-125)/U**2
            63 T3(270, 270, 270, 270, 270, 310, 320), I CASE
41220
41230C
         CASE 6. ONE-WAY FIXED END WALL
41240C:
41250 310 YX=3
41260
            BF=(1.0-U2/TAN(U2))/U*#2
41270
            AF=-BF+BSS+ASS
41280
            RETURN
41290C
         CASE 7. BNE-WAY PROPPED CANTILEVER WALL
41300C:
41310 320 VX=3
41320
            AF=TAN(I))*(TAN(U2)-U2)/(U*(TAN(U)-U))
            AF=(BF*(0.5)+SIN(U2)/TAN(U)-C3S(U2))-(SIN(U2)/TAN(U)
-C3S(U2)-SIN(U2)/SIN(U)+0.125*U*U+1.0)/U*42)/U**2
41330
41340+
41350
            RETURN
41360 999 END
50000 SUBRRUTI 1E TRANS (BIZLVIZLHI I CASEIKRAKI ZKLMI ZKLMSEI ZKLMFEI
             Z4L4P, VL.15, VL25, VS15, VS25, VL1F, VL2F, VS1F, V52F, YL1P, VL2P,
50010+
50020+
50030C
50040C: THIS SUBRAUTINE DETERMINES LIAD AND MASS TRANSFAMMACIAN FACTARS
SOUSOC: AND DYNAMIC REACTION COEFFICIENTS FOR TWO-MAY WILLS.
50060C
50070C: DETERMINE LØAD AND MASS TRANSFØRMAT(ØN FACTØRS
50080
50090
            83=B*R2
50100
            B4+92+92
            95:82*83
50110
50120
            96=93+93
50130C
501400: CASES 1 4 5 -- ELASTIC RANGE
50150 330
            7445E1=20.48*B3*(1./12.-B2/7.5+P3/21+B4/14-B5/18+B6/90)
50160
            Z445E2=0.5038-0.7066*9
50170
            TKL SE1=6. 4*B2*(1. '6.-B2/10.*B3/30.)
50180
            14LSE2=0.64-0.9134*9
50190
            BARS1 = B + (1 - /12 - B2/15 - + 93/42 - )/(1 - /6 - B2/10 - + B3/30 - )
50200
            BARS2*(0.127083-0.184524+8)/(0.4-0.508333+8)
            7445E*2445E1+2445E2
50210
20220
            ZKLSE=ZKLSE1+ZKLSE2
50230
            IF(4RA4.59.1) GTT 335
SOMACCE CRACK PATTERN A
            CVS=0.5+8
50250
03502
            CVL=0.5*(1.0~B)
50270
            4P=7L4+9/3.0
0.6505
            x84RS=8ARS1 *7L4
50230
            ?P={LV*(1+9-4+9*9/3+9)/(4+9*(1+0-4))
50300
            154RS=BARS2*ZLV
            X842P±0.5*8*7LH
50310
50320
            *84RP=ZLV#(1./24.-9/16.)/(1,/9.-8/6.)
50330
            GPTA 338
SO340C: CRACK PATITIN B
50350 335
            CVS=3.5**1.0-9)
            CVL=0.5*9
50360
50370
            XP=7LH+(1+0-4+0+3/3+0)/.4+0+(1+9-9))
50390
            XBARS=BSRS2#7LH
            ZP=ZLV+ '' 3.0
50390
50400
            234RS=9 . (51+7LV
40410
            XBARP=7LH*(1./24.-9/16.)/(1./9.-9/6.)
20420
            284902 1.58942LV
50430 339
            ZKLYBE=ZKMSE/ZKLSE
50440
            74! 4074! 4SE
50450
            GJTJ(390, 340, 310, 360, 350, 340, 4701, 1045E
50460C
504/0C; CASES 2, 3, 4 4 -- ELHSTIC RANGE
50480 350 [F((RA(+F0+1)GIT) 365
```

ANTHOUSE OF THE PROPERTY OF TH

i

The state of the s

andren english daning the control of the first probability of the control of the

Advantages Lineage September 1980 and Advantage of the Contraction of

```
$0490 60173 340
$0500 360 IF(<R4<-E7-0) G3T4 365
50510C: CASES 24, 29, 34, 49, 4 6
50520 340 ZKMFE1=512+0+85+(1+0/30+-8/10+5>3+*82/28+-83/18++84/90+)
           Z4LFE1=32.0+93+(1./12.-9/10.492/30.)
50530
50540
           BARF1=B*(+05-B/15++B2/42+)/(1+/12+-B/10++B2/30+)
50550
           90 T3 (370, 365, 370, 370, 370, 365), I CASE
50560C: CASES 24, 29, 39, 44, 4 6
50570 365 744FE2=0.4065-0.6144+8
           SKLFE2=0.5344-0.7329*8
BARF2=(.091667-.138095*8)/(.266 \7-.366667*8)
50590
50590
50600
           @ Ta: 375, 368, 375, 375, 375, 369), I CASE
50610C: CASES 2A 4 28
50620 368 ZKMFE=ZKMFE1+ZKMFE2
50.30
           ZKLFE=ZKLFE1+ZKLFE2
50640
50650Ct
50670
           ZKLFE & ZKLFE1 + ZKL SE2
50670
           G0T0 350
50720 380 KLMFE=KKMFE/KKLFE
           SKL4=ZKL4FE
50730
50740
           G8T8 390
50750C: CASE 7
50760 470 ZKL4FE=0+78
507700
50780C: ALL CASES -- PLASTIC RAVGE
50790 390 ZKMP=(1:0-8)/3:0
50500
           ZKLP=0.5-9/3.0
50510
           ZKLMP=ZKMP/ZKLP
50820C
SOR 3DC
SORAUC: DETERMINE DYNAMIC REACTION COF "CLENT" FOR SHORT (VS) AND
SORSOC: LONG (VL) EDGES
50860C
50670
           IF(ICASE-LT-5)GOTO 395
50580
           XBARS=1E-105 BARF1=1E-105 XBARP=1E-10
50890 395
           CONTINUE
50900
            00T3 (450, 400, 400, 420, 450, 400, 445), I CASE
           IF(4RA4.62.1) 63T9 410
50910 400
50920
           XBARF=BARF1 # TLH
50930
           IF(ICASE-E9-3) G3T3 430
5094C 405
           ZBARF=BARF2#7LV
           GOTO 440
XBARF=BARF2*ZLH
50950
50960 410
           IF(ICASE-EO-3) GOTO 435
50970
           ZBARF=HARF1+ZLV
50980 415
50990
            GBT8 440
51000 420
           IF(4RA4.63.1:0019 425
51010
            XBARF#BARS1+7LH
           MOTO 405
XBARF=BARS2+2LH
51020
51030 425
           GOTO 415
TRARF=BARS2+ZLV
51040
$1050 430
51060
            1 /3 440
51070 4.
              IRF=BARS1+ZLV
51080 440 LINTINUE
51090C
511000: CASES 2, 3, 4, 4 6 -- ELASTIC RANGE
           VSIF=CVS+(1.0-XP/XBARF)
51110
51120
           VS2F=CVS+(XP/XBARF)
           VLIF=CVL+(1+0-ZP/ZBARF)
51130
51140
           W.2F=CVL+(;P/7BARF)
51150
           VS1=VS1F
5:160
5:170
           VL1=VL1F
           G2T2 450
51150C
51190C: CASE 7 -- ELASTIC RANGE
51200 445 VS1F=0
51210
           V$1=0
51220
           VL1F=9.459
```

The state of the s

yvorski seetses dadina

```
51230
           VL1=VL1F
51240
           VL2F=0.165
51250C
51260C: CASE 1 & 5 -- ELASTIC RANGE
51270 450 VSIS=CVS+(1.0-XP/XBARS)
           VS2S=CVS+(XP/XBARS)
51230
51290
           VL15=CVL*(1.0-2P/78ARS)
            VL2S=CVL+(7P//BARS)
51300
51310
           G3T9(455,460,460,460,455,460,460),1CASE
51320 455
           V51=V515
51330
           VL1=VL1S
51340C
51350C: ALL CASES -- PLASTIC RANGE
           V51P=CV5+(1.0-XP/XBARP)
51360 460
           VS2P=CVS+(XP/XBARP)
51370
11380
           VL1P=CVL+(1.0-7P/79ARP)
51390
           VL2P=CVL+(7P/7R4RP)
51 400
           RETIRN
51410
           END
60000 SUBRAVITINE WINDAWCOMULT. JUNJEH, JUNJEH WASHINA AHIL. R. ICASE)
50020C: THIS SUBRAUTINE DETERMINES THE STRUCTURAL
60039C: 43DIFICATION FACTOR FOR WALLS WITH WINDOWS
60035 IF(ICASE-GT-4-AVO-1CASE-VE-10) G3T3 320
60040 RWWS=ZLVW/ZLV
60050 RWWL#ZLHW/ZLH
60060 RAREA=AWIN/AWALL
600 70 IF(R.LE.1.5) 60T9 300
60090 IF(RWWS-GT-0-7) 6373 300
60090 IF(RWWL+LT+0+5) GTT# 300
60100 IF(RWWS-E2-RWWL) 0373 300
60110C
601200: CASE WHERE LV/LH >= ..5, LVW/LV <= 0.7, AND LHW/LH >= 0.5 601300: (BUT LVW/LV NBT EDIAL TB LHW/LH)
60140 THULT=-5.85461-12.6644*RARFA+4.37662*RWWS+0.84643*RWL
           -0.223#R-1.07269#(7LVW/7LHW)#+0.9+6.59942#EXP(RAREA)
60160 GATO 315
50170C
60190C:
         CASE WHERE THE TR MORE OF ABOVE CONDITIONS IS NOT MET
60190 300 39ULT=0.62022-2.23415+RAREA++(RWHL++4)-0.79461+RWHL++2
            -2.27663*RWW.+0.62522*RWW./RAREA**(L3
60200+
            +2.63043*EXP(RAREA)-0.0-268*Rwws
60210+
60220 315 CJATINUE
60230 RETURN
60250C BNE-WAY ACTION WALLS
60260 320 SHULT=(AWALL-ZLV=ZLHW)/(AWALL-AWIN)
60270 RETURN
60290 END
           SUBRRUTINE RANDA4 (IENTRY)
70000
70010C THIS SUBROUTINE INPUTS MEAN AND STANDARD DEVIATIONS FOR MANDOM
70020C VARIABLESI
                   CENERATES RANDAM VALUES! AND CANTRILS REDUITED
THROUGH VIMBER OF CASES T. RE RIVE AND APPRILES FINAL RESILTS AND SHAMARY
700 400
70050
            C3443N Y(100)+Y1)+YFAIL+7+31J+4RE4+Z4ASS+ZKL4+V41+V42+VV1+VV2
70060
            COMMON I YALL KINC . CRF . CRAND . I . I CASE . FIL VEAIL . FR . FPM . EM . FOY
            C34434 FDC. DC41. L DTYOE. PETT. PF. PS3. PUJ. PC. TC. TO. P3. TIME. L. S
700 70
70030
            COMMITTAND/ TIMEC. I JALL
            DIMENSIAN CHISSOM, CHIPTEOM, TOISTOM
701000
70110C VAL IES FAR 97.5% (F=19.24.29.34.39.44.47)
70120
            DATA CHI25/ • 4693 • • 5167 • • 5533 • • 5425 • • 6067 • • 6267 • 6440/
            PT 4 CH1975/1-7275-1-5402-1-5766-1-5284-1-4903-1-4591-1-4331/
70130
70140
            DATA TDIST/2-093.2-064.2-045.2-032.2-022.2-016.2-010/
70150C
70140
            63 F3 (5, 50, 70) . [ENTRY
/0170
          5 XD:PHY= (N3RM1(-1.0.0.0.1.0)
SETABLED REEM WECKER STUDIETIN DORLOT
70190
           PRINTAL THEN ! A PANDE
70200
            READ, VRAV)
70219
            D3 47 1=1. V=AV5
            XDIJ44Y-XN3941 (0+0+0+0+1+0)
71220
        47 CONTINUE
70230
            (4754=0$ $P$3=0$ 4$P43=0
```

Control of the Contro

```
70250
            ICHECK=20
70260C
702700
        INPUT MEAN AND STANDARD DEVIATION FOR RANDOM VARIABLES
70230
            READ, SHEAN, 550
70290
            G1 T3 (10, 20) . ( WALL
70300
70310C
        UNREINFORCED 1 LS WITHOUT ARCHING
70320 10 PRENT 44
70330
            READ, FRAEIN . . . 40
70340
            PRINT 94
70350
            RETURN
70360C UNREINFORCED WALLS 114 ARCHING
70370 20 PRINT 85
            READ, FFM 4EAN, FPMSD
70380
            PRINT 95
70400
            RETURN
/0460C
        GENERATE RANDOM VALUES
70470C
70490
       50 G3 T3 (52, 54), I WALL
        52
            FR=XNORM1(0.0, FRMEAN, FRED)
70490
            1F(FR-L5-0) 6978 52
70500
70510
             GTT3 SA
70520
            FPM=XN3RM1(0.0.FPMMEAN,FPMSD)
            1F(FPM-LE-0) G3T3 54
70530
70540
            ALPHA=XY3R41(0.0.1.0.0.3)
70550
            IF(ALPHA-LT-0-4-27-ALPHA-GT-1-6) 6378 55
70555
            E4=1000.0*ALPH4*FP4
70535
            IF(SMEAN-ED-0) G3T3 65
70590
        60
            S=XN3RM1(J.O.SMEAN, SSU)
70600
            IF(S-LE-0) G3T3 60
70610
       65
            INDEX#INDEX+1
70620
            RETURN
70630C SUM VALUES OF PSO AND PSO++2 FOR USE IN STATISTICAL ANALYSIS
            SPS0=SPS3+PS0
70640
70650
            SSPS0=SSPS0+PS7+PS0
70660C
70670C BUTPUT FINAL RESULTS
            G3 T3 ( 72, 74) , I WALL
70690
70690
            PRINT 90, FR. S. PS3, TIMEC
70700
            G9 T9 90
70710
            PRINT 91. FPM. EM. S. PSA. TIMEC
70720
            09 F9 B0
70740 80 IF(INDEX-LT-ICHECK) RETURN
70750C
70760C DETERMINE MEAN. STANDARD DEVIATION. AND STANDARD ERROR FOR PSO
70770
            X3CVI=6V5
70790
             24EAN= 9053/743
73790
             SD=SORT((SSPS#-ZN3+ZMEAN+ZMEAN)/ZN8)
70800
            STDERR=SD/(SORT(2N8-1))
70810C CHECK IF MAXIMUM OF SO PSO SAMPLES OBTAINED 70820 IF(INDEX.ED.SO) GOTO 62
TORSOC CHECK IF 95% CONFIDENCE INTERVAL FOR MEAN PSO VALUE IS
70840
            IF(STDERR*TDIST'(INDEX-15)/5)/24EAN-GT-0-10) 6373 61
70830C
TORGOC CONFIDENCE INTERVAL IS WITHIN 10% -- DETERMINE UPPER LIMIT OF
70870C 95% CANFIDENCE INTERVAL FAR STANDARD DEVIATION
70990C PRRHABILITY VALUE AND ITS 95% CANFIDENCE INTERVAL UPPER LIMIT 70990 62 SDU=SD/(SDRT(CHI25((INDEX-15)/5)))
73900C CHECK IF MAXIMUM JF 50 PS3 SAMPLES 39TAINED
70910 IF(INDEX-ED-50) 03T8 53
709200 CHECK IF UPPER VALUE OF 95% CONFIDENCE INTERVAL FOR STANDARD
70930C DEVIATION IS WITHIN 0-104MEAN OF THE STANDARD DEVIATION 70940 IFCCCSDI-SD)/74EAN'-GT-0-10) GOTO 61
70950C
70960C 95% CONFIDENCE INTERVAL IS WITHIN 10% FOR BOTH MEAN AND 90% 70970C PROBABILITY VALUE -- THEREFORE SUFFICIENT SAMPLES OBTAINED
70980C DETERMINE 951 CONFIDENCE INTERVALS FOR MEAN, STANDARD DEVIATION
70990
71000C AND 10% AND 90% PRESABILITY VALUES
71010 53 ZMEANL+ZMEAN-STDERR*TDIST((INDEX-15)/5)
71020
             ZMEANU= ZMEAN+STOERR+TDIST((INDEX-15)/5)
71030
             SDL=SD/(SORT(CH[975(([NDEX-15)/5)))
             11.1=24E4V-1.292+SD
71040
71050
            P UL= ZYEAN-1 . 282+ SDU
```

A CONTRACTOR OF THE PROPERTY O

Į,

```
P104=2464N-1-242=50L
71060
71070
            P90=74FAN+1.292+50
71090
            P70L=74E4N+1.242+51)L
71090
            P40=1454V+1.282*50
71100
            P9011=74544+1.242+501
71110
            P90U=24EAN+1+242*59U
711200
71130C SUITPHT STATISTICAL PARAMETERS OF INCIPIENT COLLARSE PRESSURE
            PRINT 100, 74FAN, 74FANL, 1MEANU, SD, SDL, SDU, PIOL, PIOL, PIOU,
71140
71150+
              P90.P30L,P30U
            PRINT 105, INDEX, STRERR
71160
             6171 999
71170
71180C
71190C 958 CONFIDENCE INTERVAL IS NOT WITHIN 10: FOR BOTH MEAN AND 90
712009
71210C VALUES -- THEREFORE ARTAIN 5 ADDITIONAL SAMPLES
         61 ICHECK=1CHECK+5
71220
71230
             RETURN
71240C
       34 FERNATO/**(INPUT MEAN AND STANDARD DEVIATION FOR FM***)
RS FORMATO/**(INPUT MEAN AND STANDARD DEVIATION FOR F*M***)
71250
71260
         RT FORMATICIONINT MEAN AND STANDARD DEVIATION FOR SOLL)
71240
       90 FARMAT(F9.2, F11.2, F10.2, F14.3)
71290
        91 F3RMAT(F9.1,F15.1,F12.2,F10.2,F14.3)
71 300
       94 F3RMAT(///, 5x, *FR*, 10x, *S*, HT, *PS3*, 64, *C3LLAPCE TIME*)
71320
        95 F3R+AT(///,5X, *FPM=,11X, *EM=,12X, *54,3X, *P53+,6X,
71330
71340 + C3LLAPSE TINE*)
71340 100 F3RMAT(///,11x,*STATISTICAL PROPERTIES OF INCIPIENT PSO*,
71370+
              //.34x.+95t CANFIDENCE LIMITS*./. TX. *ITEM*. 14X.
                                            Inded**** 450/4' E50.5"
               •VALUE LAWER PPER.//. MEAN. F29.2
2F12.2.//. • STANDARD DEVIATION • F15.2.2F12.2.//.
71340+
71 330+
               * 101 PR3RASILITY VALUE*, 3F12-2///

* 901 PR3RASILITY VALUE*, 3F12-2/
71400+
71410+
71420 105 FARMATC//, 54. 4 NIMBER OF DESERVATIONS =**13./, 54.
               *STAVOARD FRRIR =*. FS. 2)
71 430+
71 440C
71450 999 STAPS END
71460 FUNCTION XNORMI (X, A, B)
71470 IF(X)10.20.20
71490 10 YO=RAYF( -1.0)
71490 20 K1=RANF(0.0)
71500 X2=RANF(0.0)
71510 Y=SGRT(-2.0*AL3G(X1))*(C75(6.283184*X2))
71520 XN3R41+A+Y+8
71530 RETURN
71540 EVD
```

ADDITION TO PROGRAM UNREINE TO INCLUDE LOAD TYPES 2 . (ROUGH 5:

```
2. TOTAV: 4,30 (,34)
100400
           1. CT-2 21.4-
100500
           A. HES SHIPE TINNEL LIAN
100600
           S. APRITARY LIAD CHAPE
102776
10180 014646114 11(201,00(20)
10150 GITS(1.2.3.4). LEVERY
11130 1 4113(100,110,110,120,130),60172-
10540 113 55141 410
10300 READ, IN. IO
13310 6151 125
19329 120 PRINT 615
10330 9540, 19, 11, 10
10340 125 EFECTIVE-50-11455-194
19350 PRINT 430
10350 READIRES
10370 957994
19349 129 PRINT AZA
10000 READ. MESTAT. CITCID: 00(1) - 1=1: 401(41)
```

大学的大学,在1965年,1965年中,1965年中,1965年,1965年,1965年,1965年,1965年,1965年,1965年,1965年,1965年

PROGRAM UNREINF (CONCLUDED)

1414: 64: + 1443 (/1) (+114-

PRESIDENCE OF THE PROPERTY OF

Reproduced from best available copy. 10401 -4014-1-1 13411 (-(((40.=).))5111 171 1 1421 -44(=+1(1) 1949 11 140 1:24 1-21[1] 1 1001 101 (=(20(1).)[. 16.14] + 1461(224(1) 1 145) TC=[,()-[[()) 1 145 1 11=1 11111 > 0111(111, 121, 120, 111, 141), 10 10 11/11/21 - 61:24 11211 950144 11/2) 24) F3(11/202/24)-11231 201141 10111 7 0585(730, 443, 453, 471, 443), 3847-1 2 1 1 1 202 (#(| | 45- | 2) 342, 342, 345, 4.5 INTER THE PERCENTAGE AFTER 12211 225 104 12213 705 (5(1145-13) 441,75), 353 11 17 255 114 1 2201 (1) -= 1 17/11 4-114 10261 101 1-([[4-11] 124 14 14 14 1 - 221 302 [-(1[45-5]) 1641 1641 35] 1 1 14) 300 0=013 11117 451144 1211 1-(1145-12) 142,314 112 12717 770 16([] 4 - 11) 344, 344, 414 12221 214 [+([[4--[]] 176, 276, 47] 12771 774 2=2014([]-[[44]/([]-[]) 1230) 25144 12437 443 [+(114-0,--(1(11413)9)[1 443 12341 11:11:1 12112 - (202 (11013-20(11) 1230 TERROTERIO 13911 352 32626 [144600011])+([145-1[0]])) +44410) 12011 4-1141 13161 413 3371(41 11/10), 450, 460, 471), 1, 1/4-14123 481 20141 4430140 130281 11/17 1114 1 + 15 45 = - 1 + 1 55 2 6 12 1 12 20 1 11227 -- 11-4 participation and laterative 1 400 400 20141 500 110002 14-41 4-1144 14321 ALT ETRASTICATION IT THE FOREST 14941 41 - 19/25(/+1403) 1 1/2/1/53***) 13372 PNS - 2-MYZELVO LAD IE A IAMES DE 17373 SALAIS VID 145 ELS VID SA 14111 - envice ise of a nighter 1 AT 17 KIN ENVIRONMENT 10,000 10,000 10 - 1. 1. + 20 (+) CA PARANTEZA TERRETA PARANTER SPECIAL TA PRAPARTER SPECIAL PARANTER SPECIAL SP 14147 24, 21-471(/174,41, -1,24,1,4 52) 10151 141 (1 42) + 1-13 ((-1 1-12-13-13-13)

ARCHING

Unreinforced Masonry Wall With Arching

The Control of the Co

PROGRAM ARCHING

```
01000 PREGRAM JIMBEC (INPUT, GUTPUT, TAPE1= GUTPUT)
          THIS ROUTINE IS THE CONTROLLING ROUTINE FOR THE PROGRAM USED IN THE ANALYSIS OF ONE-WAY OR TWO-WAY ACTION WALLS.
01040
             COMMON Y(100), YU, YFAIL, Q, QU, AKFA, ZMASS, ZKLM, VH1, VH2, VV1, VV2
             COMM ON KWALL, KINC, KRF, KRAND, I, ICASE, FU, VFAIL, FR, FPM, EM, FDY COMM ON FDC, D(4), LDTYPE, PEXT, PF, PSQ, PDO, PC, TC, TO, PP, TIME, L, S COMM ON RAND/ TIMEC, I WALL
01050
01060
01070
             DIMENSION A(100), V(100), T(100), VV(100), VH(100),
01080
               PEX(100), PIN(100), PN(100)
01090+
300110
011100:
           READ TITLE AND CONTROL PARAMETERS
01120 5
             PRINT 67
             READ 68, TITLE PRINT 85
01130
01140
01150
             READ, KWALL, KINC, LDTYPE, KRF, KRAND
             DELAY=0
01160
01170
             VFAIL=1E10
             CALL RESIST(1)
CALL FORCE(1)
01180
01190
01200
             1F(KRF.E0.0)G0T6 12
01210
             CALL FILL (PINT, 1)
             IF(KWALL.EQ.O)GOTO 14
0,550 15
             PRINT 86
01230
01240
             READ, DELAY
01250
             DELAY-DELAY/1000-0
01260 14
             IFCKRAND-NE-1368T8 35
             CALL FORCE(4)
CALL RANDOM(1)
CALL RANDOM(2)
01270
01280
01290 34
01300 35
             CALL RESIST(3)
01320C: MANIMUM, MAXIMUM, AND STARTING VALUES ARE DETERMINED FOR CASES
01330C: THERE THE LEAD CAUSING INCIPIENT COLLAPSE IS TO BE FOUND 01340 13 IF(KINC.EQ.0)GOTO 23
01350
              ----
              PFHAX=0
01360
01370
              PFMIN=PF/2.0
             GETE 20
01380
01393 16
              PF=(PFMIN+PFMAX)/2.0
01400 20
             CALL FORCE(2)
01410 23
             IF(KRF.E0.0)G @T@ 24
01420
             CALL FILL(PINT, 2)
014300
01440C: INITIALIZE VALUES FOR BETA METHOD (BETA = 1/6) AND COMPUTE VA U 01450C: FOR FIRST TIME INTERVAL ASSUMING WALL INITIALLY AT REST
01460 24
            I=1
              TIME=0
01470
01450
              T(1)=0$ V(1)=0$ Y(1)=0
01490
              DELTA=0.001
              IF(KWALL.EQ.O)GOTO 29
01520
             IF(TIME-GE- (DELAY-0-00001))G0T0 28
01530 27
01540
              TIME TIME + DELTA
01550
             CALL FILL (PINT. 3)
01560
             G 010 27
             PIN(1)=PINT
01570 28
01580
             TPNET=AREA+PINT
             T(1)=TIME
01590
             GOTO 30
CALL FORCE(3)
01600
01610 29
             PEX(1)=PEXT
01615
01 620
              TPNET-AREA-PEXT
01630
               PN(1)=PEXT
01640 30
             CALL RESIST(2)
01650
01660
              A(1)=TFNET/(ZMASS+ZKLM)
               VV(1)= VV1+TPNET
01670
               VH(1)=VH1+TPNFT
01 680C
01690C: PRECEDURE FER ALL SUBSEQUENT TIME INTERVALS
01700 1
01710
             IF(1.LT.101)G@T@ 11
01726
             PRINT 98, TIME
             FORMAT( 4 = 101) TIME =+, F6.3,+) WALL ASSUMED TO NET FAIL+)
01730
        98
017 40
             GOTE 6
```

we the strong are the fit hearing of the first water to be a fitting to the state of

A CONTRACT OF THE PROPERTY OF

and the second s

ye wat wat to encountry a describe absolute transmission to the sequence of the encountry to the contraction o

```
U.750 11
            TIME = TIME + DEL TA
01760
             T(I)=TIME
01770
             A(1)=A(1-1)
            CALL FORCE(3)
PEX(1)=PEXT
017 50
01790
01800
            IF(KWALL.EQ.1)GOTO 10
            IF(KRF.EC.O)GOTE 3
01810
01820
            CALL FILL (PINT. 3)
01830
             PIN(I)=PINT
            TPNET=AREA+(PEXT-PINT)
01840
01850
             GOTO 2
01860 3
             TPNET=AREA+PEXT
01870
            GOTO 2
            CALL FILL (PINT, 3)
01880 10
01890
            PIN(1)=PINT
01900
            TPNET=AREA+PINT
            PN(I)=TPNET/AREA
01910 2
            De 8 JJ=1,10
01920
01930
             Y(1)=Y(1-1)+DELTA+V(1-1)+DELTA+DELTA+(A(1-1) /3.+A(1) /6.)
01940
             CALL RESIST(2)
01950
             GT=G+AREA
01960 4
             ANEW= (TPNET-QT) /(ZMASS+ZKLM)
01970
             ADEL TA-ANEW-A(I)
01980
             A(I)+ANFH
01985 1F(ANEW. E0. 0) PRINT, +1985+, TIME, TPVET, OT, ZMASS, ZKLM, Y(1), A(1-1)
01990
             IF(ABS(ADELTA/ANEW).LT.O.01)GOTP 9
02000 8
             CENTINUE
             A(I)=ANEW-ADELTA/2.0
02010
             WRITE(1,80)TIME, PF,A(1), Y(1)
02020
02030 9
             CONTINUE
             Y(1)*Y(1-1)*DELTA*V(1-1)*DELTA*DELTA*(A(1-1) /3.*A(1) /6.)
02040
             V(1)=V(1-1)+DELTA+(A(1)+A(1-1))/2.0
02050
             VV(I)=VVI+TPNET+VV2+QT
02060
             VH(I)=VH1+TPNET+VH2+OT
02070
            IF(VV(I).GT.VFAIL)GOTO 7
02080
02090C
02100C: CHECK FOR MAXIMUM DEFLECTION OR FAILURE OF WALL 02110C: IF MAXIMUM DEFLECTION REACHED, WALL DID NOT FAIL
0211001
            IF(Y(I).LE.Y(I-1).AND.PN(I).LE.PN(I-1))COTO 6
C2120
            IF(Y(1).LT.0)GOTE 6
02130
            IF(TIME-DELAY.GE.O.010)DELTA=0.002
02140
            IF(Y(I).LT.YU)G@T@ 1
02150
            IF(TIME-DELAY.GE.O.020)DELTA=0.005
02160
            IF(TIME-DELAY.GE. J. 100) DELTA=0.
02170
            IF(TIME-DELAY.GE. 0. 500) DELTA=O.L
02180
          IF FAILURE DEFLECTION REACHED, WALL FAILED
02190C
            IF(Y(1).GE-YFAIL)GOTO 7
02200
02210
              GOTO 1
02220C
02230C: INTERVAL HALVING PRECEDURE TO DETERMINE LOAD CAUSING INCIPIENT
02240C: COLLAPSE FOR CASES WHERE DESIRED
           WALL DID NOT FAIL - SET PEMIN TO PE
0225001
            CONTINUE
02260 6
             IF (KRAND. EQ. 1)G PTO 36
02270
02280
             IF(KINC.EQ.O)GPT# 18
02290 36
            PEMINSPE
              IF (PFMAX.G . O)C PT 0 17
02300
              PF=2.0+PF
02310
05350
              GETE 20
            WALL FAILED - SET PFMAX TO PF
02330C1
             CENTINUE
02340 7
             TIMEC=TIME
IF(KRAND.EQ.1)GRTR 37
02350
02360
             IF(KINC.EQ. 0)GETØ 18
02370
02380 37
             PFMAX=PF
            CHECK TO SEE IF LOAD RANGE IS WITHIN DESIRED ACCURACY
 02390C1
              IF ((PFHAX-PFHIN) /PFHIN.GT. 0.01) GOTO 16
 02400 17
 02410
             IF(KRAND.NE.1)GET# 18
 02420
             CALL RANDOM(3)
GOTO 34
 02430
 02440C
 02450C: RUTPUT DATA INCLUDES THE MAXIMUM DEFLECTION AND TIME PF
02460C: CCURANCE FOR A NON-FAILING WALL OR THE TIME AND VELOCITY 02470C: AT COLLAPSE FOR A FAILING WALL. OPTIONAL OUTPUT IS THE
```

The state of the s

```
02460C: ENTIRE BEHAVIOR TIME-HISTORY OF THE WALL.
02500C: SUTPUT LEAD DATA
02510 18
             CALL FORCE(4)
025200
02530C: GUTPUT FINAL RESULTS
02540
             IF(Y(I).LT.YFALL)WRITE(1,70)Y(I),T(I)
02550
             IF(Y(I).GE.YFAIL)WRITE(1,71)T(I),V(I)
02560C
02570C: CHECK TO SEE IF ENTIRE TIME-HISTORY OF WALL IS DESIRED
02580
             WRITE(1.72)
02590 READ.H
             IF (M.EQ.D)GBTB 25
02400
            IF(KWALL.EG. 1)G 6T8 32
02420
02630
            IF(KRF.EQ.U)GETØ 26
             WRITE(1,75)(T(J), PEX(J), PIN(J), PN(J), Y(J), VV(J), VH(J), J=1 1)
02640
02650
             GOTO 25
02660 26
             WRITE(1,76)(T(J),PEX(J),A(J),V(J),Y(J),VV(J),VH(J),J=1,I)
02670
            G #T# 25
            WRITE(1,76)(T(J),PIN(J),A(J),V(J),Y(J),VV(J),VH(J),J=1,1)
02680 32
02490 25
             WRITE(1,77)
             GOTO 5
02700
02710C
02720 67 FORMAT( /* INPUT TITLE +, +)
02730 48 FORMAT(A59)
02740 70 FORMAT(/+WALL DID NOT FAIL - MAX. DEFLECTION OF+F6.2
02750+ + IN- REACHED AT+F7.3.+ SEC+)
02760 71 FORMATC AWALL FAILED AT+, F7.3.+ SEC (FINAL VELOCITY =+
          F7.24 IN. /SEC)+)
02770+
02780 72 FORMAT( #15 TI'E HISTORY OF WALL DESIRED (YES=1, NG=0)+,+)
02800 75 FORMAT( / 15X, *PRESSURE ON WALL* /* TIME
                                                        EXTERI OR
                             DISPLACEMENT
02810+ +INTERIPR
                     NET
                                                           UH# /
         (F6.3,3F10.3,F12.4,F11.0,F8.0))
02830 76 FERNAT( /* TIME PRESSURE ACCELERATION VELOCITY * 02840 * * DISPLACEMENT VV VH* /
         (F6.3, F9.3, F12.1, F12.2, F12.4, F11.0, F8.0))
DPRS0+
02860 77
            FORMAT(///,7(+-----))
02870 80 FERMATC/+ACCELERATION NOT CONVERGING AT TIME ++, F6-3,
                 . SEC (PF =+, F7.3, + PSI) +/+
                                                      A(I) SET EQUAL TO
*02880+
                 F8.1. (AVG BY LAST 2 ITERATIONS) +/+
F8.4. (IN. +)
02890+
                                                                Y(I) =*.
02900+
02910 85 FBRMAT(/*INPUT KWALL(O=EXT.1=INT).KINC.LDTYPE.KRF.KRAND+.
         a (leRANDEM) a)
02920+
02930 86 FORMAT(/+INPUT DELAY TIME (MSEC) TO INITIAL LOADING OF+,
          . INTERIOR WALLE, +)
02940+
02 7 50C
02960 999
02970
            END
10000 SUBROUTINE FORCE (IENTRY)
         THIS SUPROUTINE INPUTS THE LOAD PARAMETERS AND DETERMINES THE LOAD AT A GIVEN TIME FOR THE FOLLOWING LOAD TYPES:
 100100
100200
            1. IDEALIZED BLAST LOAD (FRONT OR SIDE FACE)
10030C
100800
 10090 CMM W Y(100), YU, YFAIL, Q, QU, AREA, ZMASS, ZKLM, VHI, VH2, VVI, VV2
 10100 COMMON KWALL, KINC, KRF, KRAND, I, ICASE, FU, VFAIL, FR, FPM, EM, FDY
 10110 COMMON FDC.D(4),LDTYPE,P,PR,PSO,PDO,PC,TC,TO,PO,TIME,LL,S
10140C
10150 GOTO(100, 200, 300, 4), IENTRY
10160C
10170C INPUT LEAD PARAMETERS
 10190 100 IF(KRAND-E9-0)GOTO 102
 10192 W=1000 $ PE=14.7 $ CE=1120."
                                         L-8C=1
 10194 RETURN
10196 102 PRINT 600
10200 READ, W. PO. CO. L. BC. S
10210 IF(LOC.E9.1)GOT# 105
 10220 PRINT 605
 10230 READ, ZLEN, CD
 10240 105 IF(XINC-EQ-1)RETURN
 10250 PRINT 630
10240 READ.PSb
10270 PR=2.00PSb0(7.00PB04.00PSB)/(7.04PB0PSB)
 10280 GOT# 215
11000C
```

en entre de la company de la c

The bearing the second of the

```
11010C CALCULATE LEAD PROPERTIES FOR GIVEN PEAK PRESSURE
11030 200 GOTO(205,210), LOC
11040 205 PS@ (PR-14.0+P#+5QRT(196.0+P#+P#+196.0+P#+PR+PR+PR)) /16.0
11050 GOTO 215
11060 210 PS ₽PR
11070 215 PD 6-2.5-PS 6-PS 9/(7.0+P6-PS0)
11080 U=C8+SQRT(1.0+(6.0+PS8)/(7.0+P8))
11090 TO=W++0.3333/(2.2399+0.1886+PSR)
11100 G@T#(220,225),L#C
11110 220 TC+3.0+5/U
11120 PC=PSR+(1-TC/TO)+EXP(-TC/TO)+PDR+(1-TC/TO)++2+EXP(-2+TC/TO)
11130 CD=1.0
11140 RETURN
11150 225 TA=ZLEN /U
11160 TA2=TA/2.0
11170 TA2T0+TA2/T0
1:180 PA=PS@+(1-TA2T0)+EXP(-TA2T0)+CD+PD@+(1-TA2TU)++2+EXP(-2+TA2T0)
11190 RETURN
12000C
        CALCULATE : MAD
12030 300 GOT9(305,310),LOC
12040 305 TT0=TIME/TO
12050 IF(TIME.GT.TC)G0T0 320
12060 P=FC+(TC-TIME)+(PR-PC) /TC
2070 RETURN
12090 1F(TIME-GT-TA) /TO
12100 P=PA+TIME/TA
12110 RETURN
12120 320 IF(TTO-GE-1-0)6010 330
12130 P=PS@+(1-TT0)+EXP(-TT0)+CD+PD@+(1-TT0)++2+EXP(-2+TT0)
12150 RETURN
12160 330 P=0
2170 RETURN
13000C
13010C PRINT LEAD DATA
13020 4 IF(KINC.E0.0)G0T0 400
13030 PRINT 640.LDTYPE
13040 GBT6 410
13050 400 PRINT 645.LDTYPE
13060 410 CENTINUE
13070 415 G@T@(420,425), L@C
13080 420 PRINT 650
13090 G ET# 430
13100 425 PRINT 655
13110 430 PRINT 660, W. P. C. C.
13120 IF (KRAND.NE. O) RETURN
13130 GOT#(435, 440).LOC
13140 435 PRINT 665, S, TC, PR
13150 G 8T8 445
13160 440 PRINT 670, ZLEN, TA, PA
13170 445 PRINT 675, U, TO, CD, PS&, PD@
13180 RETURN
14000C
14010 600 FERMAT( MINPUT W.PE, CO.LOC, S+,+)
14020 605 FORMAT( PINPUT L, CD+,+)
14060 600 FBRMAT(/+INPUT PS#++)
1-070 640 FORMAT( -- LOAD CAUSING INCIPIENT FAILURE .. ) AS FOLLOWS! ..
14071+
           / SX. +L BAD TYPE NUMBER+, 12)
14080 645 FORMAT( /*PROPERTIES OF LOAD ACTING ON WALL ARE AS FOLLOWS:*
14081* /*SX, *LOAD TYPE NUMBER*, 12)
14090 650 FORMAT(8X, +(FRENT FACE)+)
14100 655 FORMAT(8X, +(SIDE FACE)+)
14110 660 FERMAT(10X, *W =+, F8-1, + KT
                                             P8 =+. F6.2. + PSI
          F7.1, * FPS*)
14120 665 FORMAT(10X, +S =+, F6-1, + FT
                                               TC =*, F6.3, * SEC
           $7.3.0 PSIO)
14121+
14130 670 FEMATCIOX, +L =+. F6.1. + FT
                                               TA **. F6.3. * SEC
                                                                        PA ...
14131^
           F7.3, * PSI+)
14140 675 FORMAT(10X,+U =+, F7.1,+ FPS
                                              TO **. F8.3. * SEC
          F5-1, /, 8X, +PS8 m+, F7-3, + PS1 PDL 4+, F7-3, + PS1+)
14141+
15000 END
20000 SUBROUTINE FILL (P3, IENTRY)
20010C1 COMPUTES AVERAGE AIR PRESTURE IN ROOM DUE TO BLAST WAVE
```

DESCRIPTION OF THE PROPERTY OF

```
20020C: INCIDENT HEAD- ON UP ON FRONT WALL.
20030C
20040 COMM EN Y(100), YU, YFAIL, 9, QU, AREA, ZMASS, ZKLM, VH1, V. 2, VV1, VV2
20060 COMON KWALL, KINC, KRF, KRAND, II, ICASE, FU, VFAIL, FR, FPM, EM, FDY
20070 COMON FDC.D(4) LDTYPE, PEXT, PR, FSG, PDG, PC, TC, TO, PG, TIME, L. S
20080 DIMENSION AA(8,2), NN(8)
20090 LOGICAL LI, L2, L3
20100 3 6T 0(10, 13, 11), 1 ENTRY
20110 10 PRINT 700
20115 RH00=0.076 f L1=.FALSE.
20120 READ, N# 1N. V3
20125 AT=0$ AFRWNT=0$ ASIDE=0
20130 DØ 18 I=1, NW IN
20140 PRINT 710,1
20150 READ, PACI, 1), NN(1), AAC1, 2)
20150 AA(1,2)=AA(1,2)/1000.0
20161 AT=AT+AA(1,1)
20162 M=NN(1)5 GBTB(12,14,14),M
20163 12 AFRONT-AFRONT-AA(1,1)
20164 GBT# 18
20165 14 ASIDE=ASIDE+AA(1,1)
20170 18 CENTINUE
20175 AFRENT-AFRENT/ATS ASIDE-ASIDE/AT
20180 700 FERMAT(/**INPUT NWIN AND ROEN VOLUME (CF)***)
20200 710 FERMAT(/**INPUT AREA (SQ FT)**LOCATION CODE & DELAY(MSEC)**
20210+ + FRR WINDON+, 12,+)
20230 G=1.4 $ G2=1.7G $ G3=1.-G2 $ G4=2.7G3 $ G5=G+1.
20240 G6=2.+G/G5 $ G7+(G-1.)/G5
20250 PPR=-1912
20260 C=SQRT:G+P6+32.+144./RH66)
20270 TAU=2.+(V3++(1./3.))/C
20280 NSTEP=4
20290 DT=TAU ASTEP
20300 RETURN
20310C
20320 13 P3 ₽₽P#
20330 TT+0.5 T0=0.
20340 RH03 0=RH00
20350 L2*.FALSE. $ L3*.FALSE.
20360 RETURN
20370C
20380 11 IF(L1)G@10 52
20365 IF(L2.A.L3)G016 9
20390 52 DCT=(TIME-T3)+0.5
20395 IST@F=2
20400 53 IF(DDT-LT-DT)-1818 51
20410 50 DDT=0.5+DDT
20413 IST@P=2+1ST@P
20420 GB TB 53
20430 51 CENTINUE
20440 DB 99 I=1.15TBP
20450 TT+T8+1+DDT
20460 IF(TT.GT.TO)GE TE 99
20470 DM=0. $ WW=0. $ NW=0
20480 D8 500 K=1.NMIN
20490 M=NN(") $ DLY=AA(K,2)+0.000001
20500 IF(DLY-GE-TT)G8 T8 500
20510 GOTP(15,14,16).M
20520 15 CDF=1.0
20530 IF(TT-TC,20,20,21
20540 20 P11=(TC-TT)+(PR-PC) /TC+PC
20550 P11=P11+P8
20560 G8 T8 30
20570 16 CDF=-0-4
20600 21 R=TT/TO $ RR=1.-R
20610 PD=PD@+RR+RR+EXP(-2.+R)
20620 PS=PS#-RR+EXP(-R)
20630 Pli=P5+CDF+PD
90640 Pli=Pli+P8
20650 30 RM81=RH88+((Pli/P8)++62)
20660 IF(P11-P3#)36,36,37
80470 36 JSIGN--1
80480 L2-- TRUE-
20770 303 P2*P11
```

Management of the second secon

```
20780 RH92+((P2/P30)++G2)+RH830
20790 X=P38/RH#38
20800 GØ T9 38
20810 37 JSIGN++1
20820 306 P2=[r20P11
20830 RH02=((P2/P11)++G2)+RH01
20840 X-P11/RH81
20850 38 U22=G4+(X-P2/RH02)+32.+144.
20860 IF(U2C)40,39,39
2087 0 40 PRINT. + U22 NEGATIVE+, U22
20880 STOP
20890 39 U2=SQRT(U22)+JSIGN
20900 DDM=U2+RH@2+AA(K,1)+DDT
20910 DH=DH+DDM
20920 W=WW+P11+DDM/(G_+RH81)
20930 500 CENTINUE
20940 P38=P38+(G-1.)*WW/V3
20950 RH838=RH838+DM/V3
20960 99 CONTINUE
20970 T9-TT
20980 P3=P30-P0
20982 IF(TIME.GE.TC)L3=.TRUE.
20983 RETURN
20984 9 R=TIME/TO S RR=1.0-R
20985 PD+PD0+RR+R+EXP(-2.0+R)
20986 PS+PS+RR+EXP(-R)
20967 P3=P5+PD+(AFR@NT-0.4+ASIDE)
20990 999 RETURN
21020 END
30000 SUBROUTINE RESIST (IENTRY)
30010C
30020C THIS SUBROUTINE INPUTS THE REQUIRED DATA AND COMPUTES VARIOUS
30030C QUANTITIES USED IN THE ANALYSIS OF WALLS WITH ONE-WAY ARCHING
30040C (SUPPERT CASE 9) OR TWO-WAY ARCHING (SUPPORT CASE 10)
30050C
300 60
            COMMON Y(100), YU, YFAIL, Q, QU, AREA, ZHASS, ZKLM, VHI, VH2, VVI, VV2
            COMMON KWALLSKING, KSF, KRAND, I. ICASE, FU, VFAIL, FR, FPM, EM, FDY COMMON FDC, D(4), LDTYPE, PEXT, PF, PSO, PDO, PC, TC, TO, PO, TIME, L, S
30080
30090
30095
            COMMON /RAND/ TIMEC, IWALL
301100
            GOT 0(1.99.2). IENTRY
30120
30125C
30130C INPUT WALL DATA
         1 PRIN': 60
30140
30150
            READ, ZLV, ZLH, TW, TFLG, EM, FPM, I CASE, ZLVW, ZLHW, GPMMA
301 60C
3017GC DETERMINE VALUES OF VARIOUS CONSTANTS
30175
            IWALL=2
30180
            ZL2=ZLV/2.0
            AWALL=ZLV=ZLH
AWIN=ZLVW=ZLHW
30190
20200
30210
            AREA-AHALL-AVIN
30220
            ZMASS=GAMMA+AREA+TW/(386-07+1728-0)
30230
            RATI - ZLV/ZLH
30240
            IF(ICASE. EQ. 9) RATI 0-0
            BETA=0.5+(SQRT(3.0+RATI@++2+RATI@++4) RATI@++2)
30250
30260
            ZKLM=(2.0-2.0+BETA)/(3.0-2.0+BETA)
30270
            VVI=BETA/6.0
30280
            VV2=BETA /3.0
30290
            VH2=(3.0-4.0+BETA)++2/(12.0+(2.0-3.0+BETA))
30300
            VH1=(1.0-BETA) /2.0-VH2
3C310
            ZLD=SGRT(ZL2+ZL2+TW+TW)
            EPT (ZLD-ZL2)/ZLD
30320
30340
            C2:2.0-4.0.BETA
30330
            C3=0
            IF(RATIO-EG-0)GOTØ 9
30360
30370
            C3=4.0+BETA+RATI 0++2/BETA
30380
          9 CONTINUE
30390
            C4=12.0/(ZLV=ZLV=(3.0-2.0=BETA))
30400
            YFAIL= TW
30410C
30420C
         DETERMINE MODIFICATION FACTOR FOR WALL WITH WINDOWS
30430C
30440
            94ULT=1.0
```

一一一日日本日本日本日本日本日本日本日本日本日本日本

```
30450
            IF(AWIN.NE.O) CALL WINDOW (OMUL'I, ZLV, ZLH, ZLW, ZLHW, AWIN,
30460+
               AVALL, RATIO, ICASE)
3047 OC
30480C
         GUTPUT WALL PROPERTIES
30490
            PRINT 62, ICASE, ZLV, ZLH, RATIO, TW, EM, FPM, GAMMA, TFLG, ZLW,
30500+
               ZLHW. OMULT
30510
            RETURN
30520C
30530
         2 YU=TW#FPM /(EM#EPSM)
30540
            TFLG2=2.0+TFLG
            IFITTLG.NE.O)GOTO 3
30550
30560C
30570C SOLID MASONRY WALL
         5 ZMU=0.250FPH+("H-YU)+02
C1=0.50ZMU0YU+FPH+(TH-YU)++3/12.U
30380
30590
30600
            GETE 4
30610C
30420C HELLEW HASBNRY UNIT WALL
30630
         3 Y2=TW-2.0=TFLG
30640
            IF(YU.LT.Y2)GOTO 6
30650C YU-Y2 -- TREAT WALL AS SELID WALL 30660 TFL62=05 G0T6 5
30670
          & PFLG=FFM+TFLG
30480
            TWF=TW-TFLG
30 69 0
            ZMU-PFLG+(TWF-YU)
30700
            ZM2-PFLG+TFLG
30710
            C6=0.5+(ZMU+YU+PFLG+(TW'-YU)++2)
30720
            C7=C6+FPM+TFLG++3/6.0
30730
          4 9U=8.0+ZMU/(ZLV+ZLV)
307 40
            RETURN
307 50C
307 60
         60 FORMAT( // INPUT LV, LH, TW, TFLG, EM, FPM, ICASE, LVW, LHW, GAMMA .)
30770
         62 FORMAT( / PROPERTIES OF UNREINFORCED MASONRY WALL (ARC-ING)
3077 5+
              . -- SUPPORT TYPE NO. .. 13,
              7,6% eLV =+,F6.1, e INCHES+,6%,eLH =+,F6.1,
e INCHES RATIO =+,F6.3,/6%,eTV =+,F5.1,+ INCHES+,
7% eEM =+,F10.1,+ PSI F'M =+,F8.2,+ PSI+,/3%,
30780+
30790+
30800+
              *CAMMA **, F6.1, * PCF*, 7X, *TFLG **, F6.3, * INCHES*,
30810+
              SX. LVW a. F6.1. INCHES. SX. LHW =. F6.1. INCHES.
30820+
              5X, + QMULT = 4, F6.3)
30830+
30835C
        DETERMENT THE RESISTANCE FOR THE WALL AT A DEFLECTION OF Y(1)
30 E 40 C
30840
         99 IF(Y(1).GT.Yd)G@T@ 100
30 67 OC
30880C DEFLECTION OF WALL LESS THAN YU
30890
            ZMC=Y(1)+ZMU/YU
30900
            ZMAVG=0.5+ZMC
30910
            86T0 130
309200
30930C DEFLECTION OF WALL GREATER THAN YU
       100 IF(TFLG2-NE-0)GOTS 110
ZNC=0.25=FFM=(TW-Y(1))==2
30940
30950
30960
            ZMAVB=(C1-FPM+(TW-Y(1))++3/12-0) /Y(1)
30970
            GOT# 130
309800
30990C HELLEW MASSNRY UNIT WALL -- DEFLECTION LESS THAN YE
1000 110 IF(Y(1).GT.Y2)G010 120
J1010
            ZMC-PFLG+(TWF-Y(I))
31020
            ZMAVG=(C6-0.5+PFLG+(TWF-Y(1))++2)/Y(1)
31037
            G ⊌T● 130
31040C
31050C HELLOW MASONRY UNIT WALL -- DEFLECTION GREATER THAN Y2
      120 ZMC=0.25=FPH=(TW-Y(1))++2
31060
            ZMAVG=(C7-(TW-Y(I))++2/12-0)/Y(I)
31070
31080
            GOT# 130
310900
31100C COMPUTE TOTAL RESISTANCE OF WALL
      130 Q=C4+(C2+ZHC+C3+ZHAVG)+QHULT
IF DEFLECTION IS GREATER THAY WALL THICKNESS, RESISTANCE = 0
31110
31120C
31130
            IF(Y(1).GT.TW)@=1E-10
31140
            RETURN
31150
60000 SUBROUTINE WINDOW (GMULT, ZLV, ZLH, ZLVW, ZLHW, AWIN, AWALL, R, ICASE)
60010C
```

White the state of the same of

The state of the s

pph white commence in a charge in a commence of the commence of the charge of the char

70500

```
60020C: THIS SUBROUTINE DETER THE STRUCTURAL
60030C: MODIFICATION FACTOR FOR WALLS WITH WINDOWS
60035 IF(ICASE.GT. 4. AND. ICASE.NE. 10) GOT 0 320
60040 RWWS=ZLVW/ZLV
60050 RWWL=ZLHW/ZLH
60060 RAREA=AWIN /AWALL
60070 IF(R.LE.1.5)G@T@ 300
60080 IF(RWWS-GT-0-7)G @TØ 300
60090 IF(RWWL.LT.0.5)G0T0 300 60:00 IF(RWWS.EQ.RWWL)G0T0 300
60110C
60120C: CASE WHERE LV/LH >= 1.5, LVW/LV <= 0.7, AND LHW/LH >= 0.5 60130C: (BUT LVW/LV NOT EQUAL TO LHW/LH)
60140 QMULT=-5.85461-12.6644+RAREA+4.39662+RWWS+0.84843+RWWL
60150+
            -0.223+R-1.07269+(ZLVW/ZLHH)++0.9+6.59942+EXP(RAREA)
60160 GOTO 315
60170C
          CASE WHERE ONE OR MORE OF ABOVE CONDITIONS IS NOT MET
60190 300 QMULT=0.62022-2.23415+RAREA++(RWHL++4)-0.79461+RWWL++2
60200+
             -2.27 663 * RWWL+0. 62522 * RWWL / RAREA * +0.3
60210+
             +2.63043*EXP(RAREA)-0.09268*RWWS
60220 315 CONTINUE
60230 RETURN
60240C
60250C ENE-WAY ACTION WALLS
AD260 320 GMULT=(AWALL-ZLV+ZLHW) /(AWALL-AW N)
6027 0 RETURN
60280 END
70000
            SUBROUTINE RANDOM (IENTRY)
70010C THIS SUBROUTINE INPUTS MEAN AND STANDARD DEVIATIONS FOR RANDEM
70020C VARIABLES! GENERATES RANDOM VALUES! AND CONTROLS REQUIRED
70030C NUMBER OF CASES TO BE RUN; AND OUTPUTS FINAL RESULTS AND SUMMARY
70040C
70050
            COMMON Y(100), YU, YFAIL, Q. QU, AREA, ZMASS, ZKLM, VH1, VH2, VV1, VV2
            COMMON KWALL, KINC, KRF, KRAND, I, ICASE, FU, VFAIL, FR, FPM, EM, FDY COMMON FDC, D(4), LDTYPE, PEXT, PF, PSQ, PDO, PC, TC, TO, PG, TIME, L, S
70060
7007 0
70050
            COMMON /RAND/ TIMEC, I WALL
70090
            DIMENSION CHI25(7), CHI975(7), T915T(7)
70100C
70110C VALUES FOR 97.5% (F=19,24,29,34,39,44,49)
            DATA CHI25/-4688, -5167, -5533, -5825, -6065, -6267, -6440 /
DATA CHI975/1-7295, 1-6402, 1-5766, 1-5284, 1-4903, 1-4591, 1-4331 /
70120
70130
70140
            DATA TDIST/2.093, 2.064, 2.045, 2.032, 2.022, 2.016, 2.010/
70150C
70160
            GOTO(5, 50, 70), IENTRY
70170 5 XDUMMY=XN 8RM1(-1.0,0.0,1.0)
70180C INITIALIZE RAND M NUMBER GENERATOR
70190
            PRINT, / + INPUT NRAND+,
70200
            READ, NRAND
70210
            D8 47 I=1.NRAND
70220
            XDUMMY= XN 0RM1 (0.0, 0.0, 1.0)
70230
         47 CONTINUE
70240
            INDEX=0$ SPS@=0$ SSPS@=0
70250
            ICHECK=20
70260C
7027 OC
         INPUT MEAN AND STANDARD DEVIATION FOR RANDOM VARIABLES
70280
            PRINT 87
70290
            READ, SMEAN, SSD
70300
            GOTO(10,20), IWALL
         UNREINFORCED WALLS WITHOUT ARCHING
70310C
70320
        10
            PRINT 84
70330
            READ, FRMEAN, FRSD
70340
            PRINT 94
70350
            RETURN
70360C
         UNREINFORCED WALLS WITH ARCHING
70370
       20 PRINT 85
            READ, FPHMEAN, FPMSD
PRINT 95
70380
70390
70400
            RETURN
70460C
7047 OC
        GENERATE RANDEM VALUES
70480
            GETB(52,54), IWALL
            FREXNERMS (0.0, FRMEAN, FRSD)
70490
        52
```

THE RESIDENCE OF THE PARTY OF T

IF(FR-LE-0)GOTE 52

The state of the s

```
70510
             G0T0 58
       54 FPH=XNBRM1(0.0, FPHHEAN, FPHSD)
70520
70530
             IF(FPN.LE.Q)GOTO 54
70540 55 ALPHA=XN@RM1(0.0,1.0,0.3)
             IF(ALPHA.LT.O. 4. eR. ALPHA. GT. 1. 6) GOT 0 55
70550
             EM#100G.O#ALPHA#FPM
70555
70585 58 IF(SMEAN.EQ.0)G8T0 65
        60 S=XN GRM1 (0.0, SMEAN, SSD)
70590
             IF(S.LE.O)GOTO 60
70600
70610
        65 INDEX=INDEX+1
79620
             RETURN
7U63OC SUM VALUES OF PSB AND PSO+02 FOR USE IN STATISTICAL ANALYSIS 70640 70 SPSO-SPSO-PSO
70650
             SSPS = SSPS +PS +PS
70660C
7067 OC OUTPUT FINAL RESULTS
             GOTO(72,74), IWALL
70690 72 PRINT 90, FR. S. PSB. TIMEC
70700
             GOTO 80
70710 74 PRINT 91, FPM, EM, S, PSO, 1 IMEC
70720
             G 678 80
70740 80 IF(INDEX-LT-ICHECK) RETURN
707 50C
70760C DETERMINE MEAN, STANDARD DEVIATION, AND STANDARD ERROR FOR PSE
70770
             ZN 0= INDEX
70780
             ZHEAN=SPSB/ZNB
70790
              SD=SGRT((SSPSG-ZNG)ZMEAN+ZMEAN; /ZNG)
70800
             STDERR-SD/(SQRT(ZN 6-1))
70810C CHECK IF MAXIMUM OF 50 PSO SAMPLES ESTAINED
70820 IF (INDEX-EQ-50) GOTO 62
70830C CHECK IF 95% CONFIDENCE INTERVAL FOR MEAN PSP VALUE IS
             IF(STDERR*TDIST((INDEX-15) /5) /ZMEAN.GT.O. 10)GETE 61
70860C CONFIDENCE INTERVAL IS WITHIN 10% -- DETERMINE UPPER LIMIT OF
70870C 95% CONFIDENCE INTERVAL FOR STANDARD DEVIATION
70880C PROBABILITY VALUE AND ITS 95% CONFIDENCE INTERVAL UPPER LIMIT
70890 62 SDU=SD/(SQRT(CH125(CINDEX-15)/5)))
70900C CHECK IF MAXIMUM OF 50 PSD SAMPLES OBTAINED
70910 IFCINDEX-EQ-50)GOTO 53
70920C CHECK IF UPPER VALUE OF 95% CONFIDENCE INTERVAL FOR STANDARD
70930C DEVIATION IS WITHIN O. 10 MEAN OF THE STANDARD DEVIATION
70940
              IF(((SDU-SD)/ZHEAN).GT.0.10)68T0 61
709500
70960C 95% CONFIDENCE INTERVAL IS WITHIN 10% FOR BOTH HEAN AND 90% 70970C PROBABILITY VALUE -- THEREFORE SUFFICIENT SAMPLES OBTAINED 70980C DETERMINE 95% CONFIDENCE INTERVALS FOR HEAN, STANDARD DEVIATION
70990.
71000C AND 10% AND 90% PREBABILITY VALUES
          53 ZMEANL=ZMEAN-STDERR+TDIST((ENDEX-15)/5)
71010
71020
              ZMEAN U-ZMEAN+STOERR+TDIST((INDEX-15)/5)
7103C
              SDL=SD/(SORT(CH1975((IHDEX-15)/S?))
71040
              P10=ZHEAN-1.282+SD
71050
              P10L=ZMEAN-1-282+SDU
              P10U=ZMEAN-1.282+5DL
71060
              P90=ZMEAN+1.282+5D
71070
71080
              P90L=ZMEAN+1.282+SDL
71090
              P90=ZMEAN+1.282+SD
              P90U=ZMEAN+1.282+SDU
 71100
              P90U=ZMEAN+1.282+SDU
71110
71120C
71130C BUTPUT STATISTICAL PARAMETERS OF INCIPIENT COLLAPSE PRESSURE
71140 PRINT 100, ZHEAN, ZHEANL, ZHEANU, SD, SDL, SDU, P10, F10L, P10U
                P90, P90L., P90U
71:50+
              PRINT 105, INDEX, STDERR
71140
              GOTO 999
71170
71180C
 71190C 952 CONFIDENCE INTERVAL IS NOT WITHIN 10% FOR BOTH MEAN AND 90
71200B
71210C VALUES -- THEREFORE OBTAIN 5 ADDITIONAL SAMPLES
          61 ICHECK-ICHECK+5
71220
71230
              RETURN
71240C
71850 84 FORMAT( MINPUT MEAN AND STANDARD DEVIATION FOR FRO. 1)
71260 85 FERNATC MINPUT HEAN AND STANDARD DEVIATION FOR FI HO. 1)
```

PROVINCE OF SECTION

The same of the transmission of the same o

```
87 FORMAT( MINPUT MEAN AND STANDARD DEVIATION FOR Se. +)
71280
71290
      90 FORMAT(F9.2, F11.2, F10.2, F14.3)
71300
       91 FØRMAT(F9.1.F15.1.F12.2.F10.2.F14.3)
71320
       94 FORMAT( ///, 5X, *FR+, 10X, *S+, 8X, *P30+, 6X, *COLLAPSE TIME*)
      95 FORMAT( ///, 5% *FPM*, 11%, *EM*, 12%, *Sn, 8%, *PS@*, 6%, *C@LLAPSE TIME*)
71330
71340+
71360 100 FORMAT( ///, 11X, *STATISTICAL PROPERTIES OF INCIPIENT PSO+,
             //. 39X, +95% CONFIDENCE LIMITS*, /.7X, +ITEM+, 18X,
71370+
             *VALUE
                          LEWER
                                       UPP"R+, //, * MEAN+, F29.2,
71360+
             2F12.2, //. * STANDARD DEVIATI . ** F15.2, 2F12.2, //.
71350+
71440C
71450 999 STOPS END
71460 FUNCTION XNORM1(X,A,B)
71470 IF(X)10,20,20
71480 10 X0=RANF(-1.0)
71490 20 X1=RANF(0.0)
71500 X2=RANF(0.0)
71510 Y=SORT(-2.0+AL 8G(X1))+(C0S(6.283184+X2))
71520 XN 0RM1=A+Y+B
71530 RETURN
71540 END
```

THE THE PARTY OF THE STATE OF T

ADDITION 18 PROGRAM ARCHING TO INCLUDE LOAD TYPES 2 THROUGH 5:

```
10040C
              2. TRINGULAR LOAD
10050C 3. STEP PULSE
10060C 4. URS SHECK TUNNEL LEAD
10070C 5. ARBITPARY LEAD SHAPE
10180 DIMENSIEN TT(20), PP(20)
10150 GOTO(1.2.3.4). IENTRY
10180 1 GOTO(100,110,110,120,130),LDTYPE
10290 110 PRINT 610
10300 READ, TR, TO
10310 GOTO 125
10320 120 PRINT 615
10330 READ, TR, T1, T0
10340 125 IF (KINC-EG-1) RETURN
10350 PRINT 630
10360 READ, PS0
10370 RETURN
10380 130 PRINT 620
1 C390 READ, NPOINT, (TT(J), PP(J), J=1, NPOINT)
10400 FACTER=1-0
10410 IF(KINC-EQ-0)GOTO 150
10420 PMAX=PP(1)
10430 D0 140 J=2.NP0INT
10440 140 1F(PP(J).GT.PMAX)PMAX=PP(J)
10450 150 PX=PP(2)-PP(1)
10460 TX=TT(2)-TT(1)
10465 JJ#1
10470 RETURN
11020 2 GET#(200,230,230,230,240),LDTYPE
11200 230 PSE=PR
11210 RETURM
11220 240 FACTOR=PR/PMAX
11225 GOTO 150
11230 KETURN
12020 3 GET#(300,340,360,370,380),LDTYPE
18180 340 IF(TIME-TR)342,345,345
12190 342 P=PSE+TIME/TR
1 E200 RETURN
12210 345 IF(TIME-TO)347,350,350
12220 347 P=PSG+(TO-TIME)/(TO-TR)
```

And the second s

PROGRAM ARCHING (CONCLUDED)

```
1 2230 RETURN
1 2240 350 P=0
12250 RETURN
12260 360 1F(TIME-TR)342,362,362
12270 362 1F(TIME-TO)364,364,350
12280 364 P=PS0
12290 RETURN
12300 IF(TIME-TR)342,372,372
12310 372 IF(TIME-T1)364,364,374
12320 374 IF(TIME-TC)376,376,350
12330 376 P=P50+(TO-TIME)/(TC-T1)
12340 RETURN
12350 380 IF(TIME+LE+TT(JJ+1>)G0T0 385
12360 JJ=JJ+1
12370 PX=PP(JJ+1)-PP(JJ)
(LL)TT-(1+LL)TT=XT 08091
12390 GJTØ 380
12400 385 P=FACT@R+(PP(JJ)+(TIME-TT(JJ))+PX/TX)
12410 RETURN
13060 410 GOTO(415, 450, 450, 460, 470), LDTYPE
13190 450 PRINT 680, TR, TO, PS0
13200 RETURN
13210 460 PRINT 685.TR.T1.TO.PS0
13220 RETURN
13230 470 D0 480 J=1*NP0INT
13240 P=FACTOR=PP(J)
13250 480 PRINT 690, TT(J).P
13260 RETURN
13280 RELUNT
14030 610 FRMAT(/**INPUT TR,*T0*,*)
14040 615 FRMAT(/**INPUT TR,*T1,*T0*,*)
14050 620 FRMAT(/**INPUT NUMBER &F LWAD PRINTS AND THE TIME AND *,
14051* **PRESSURE AT EACH PRINT**)
14150 680 FRMAT(/**10X***TR =**,*F6*3,** SEC PS# =
14151+ F7.3.+ PSI+)
14160 685 FGRMAT(/1UX.+TR =+.F6.3.+ SEC T1 =+.F6.3.+ SEC
14161+ F6.3, * SEC*, /.9X, *PS0 **, F7.3, * PS1*)
14170 690 F9RMAT(F15.3, F12-2)
14180 695 FORMAT(/10X++TIME
                                                     PRESSURE®)
```

aling of the contract of the parties of the properties of the properties of the parties of the p

RCWALL

Reinforced Concrete Wall

PROGRAM RCWALL

the second secon

```
00100 PREGRAM RCWALL1 (INPUT, BUTPUT)
00105 CALL RETR(THRCWALL2, THRCWALL2)
00105: THIS PORTION OF THE PROGRAM INPUTS THE REQUIRED WALL AND LOAD
001156: DATA AND INITIALIZES CERTAIN PARAMETERS
00150 COMMON KWALL-KINC-LDTYPE-KRF-KRAND-TIME-I-Y(100)-Q-QU-YU-YFAIL-
         ZLV, ZLH, TW, PV, FPC, FDY, I CASE, NBBAR, AS(4), APS(4), D(4), DP(4), FDC,
EC, ES, R, ALP, ALP2, ARE1, ZMASS, OMULT, VFAIL, ZKLM, VH1, VH2, VV1, VV2,
W, PB, CB, LBC, S, ZLEN, CD, PSB, PDB, PR, PEXT, PC, TC, TO, DELAY,
00152+
00154+
00156+
         NWIN, RHOO, VILLI, AA(R, 2), NY(B), AFRONT, ASIDE, G. G2, G3, G4, PP2, DT
00165C
001 70C:
          READ TITLE AND CONTROL PARAMETERS
OO175 PRINT 67
OO180 READ 69 TITLE
00165 PRINT 85
00190 READ, KHALL, KINC, LDTYPE, KRF, KRAND
00195 DELAY=0
00200 VFAIL=1610
00205 67 FØRMAT(/*INPUT TITLE***)
00210 48 FORMAT(A59)
00215 85 FORMAT(/+) PUT (WALL(0=EXT, 1=INT), (INC, LDTYPE, CRF, CRAND+,
           *(1=RAVD@4)+)
+02200
00225C
00230C: * DETERMINE WALL PROPERTIES INDEPENDENT OF FDC, FDY, AND D
00235C
00240 4 D3 5 I=1,4
00245 AS(1)=0
00250 5 CONTINUE
00255C
00260C: . INPUT AND ECHO WALL AND REINFORCEMENT PROPERTIES +
00270 PRINT 615
00275 READ, ZLV, ZLJ, 1 W, PV, FPC, FDY, ICASE, ZLV W, ZLHW, NJRAR
00290 FDC=1-25+FPC
00285 EC=57619.0*SQRT(FPC)
00290 ES=29E6
00295 ECKIP=EC/1000$ ESKIP=ES/1000
00300 R=ZLH/ZLV
00305 ALP=1.0/RS ALP2=ALP+ALP
00310 IF(ICASE-LE-4) GOTO 11
00315 R=0$ ALP=0$ ALP2=0
00320 11 PRINT 670
00325 DØ 8 1=1.4
00330 PRINT 625.1
00335 READ.AS(1).D(1).APS(1).DP(1)
00350 IF(I.NE-1)00T3 3
00355 GET3(8,8,8,8,4,7,7),1CASE
00360 3 00T3(9.8.7.6.9.9.9), ICASE
00365 6 IF(I.EQ.3)(0)T3 9
00370 G3T9 B
DOSRO 9 CONTINUE
00385 9 C3NTI NUE
00395C: ********
00400C: * DETERMINE DEFLECTION AND MOMENT CREFFICIENTS *
004050: ***************************
00410C
00415 AWALL=ZLV=ZLH
00420 AWINEZLVWEZLHW
00425 AREA=AWALL-AWIN
00430 ZMASS=150+0*4REA+TW/(396+07+1729+0)
00435 24ULT=1.0
00440 TECAMIN-NE-O) CALL MINDOW COMMET-ZEV-ZEH-ZEVM-ZEH MANIN-AMALLA
            R. I CASE)
90445 PRINT 620, ICASE, ZLV, ZLH, ALP, TW, FPC, ECKIP, FDY, ESKIP, PV,
00450+ ZLVW-ZLHW-QMULT
00455 PRINT 630
00460 DB 110 I=1,4
00465 IF(AS(I)+E2+0)@T0 110
00467 P=AS(1)/(12-0+D(1)) $ PP=APS(1)/(12-0+D(1))
00470 PRINT 640-1-AS(1)-P-D(1)-APS(1)-PP-DP(1)
00475C CHANGE UNITS OF REINFARCEMENT FROM SO-IN-/FT TO SO-IN-/IN-
00450 AS(1)=AS(1)/12.0
00485 APS(1)=AP$(1)/12.0
```

Maria Company and Street M. and Street

Single Committee Com

Algorithm with the control of the property of the control of the c

```
00490 110 CONTINUE
00495 615 FORMAT(/*INPUT LV.LH, TW.PV.F'C.FDY, ICASE, LVW.LHW. NOBAR*)
00500 620 FORMAT(//*PROPERTIES OF RE: NFORCED CONCRETE WALL --*,
               00505+
00510+
                                                  F'C ##, F7-1, # PSI#, 5X,
               *EC =*, F7.1, * 4514, /, * FDY =*, F8.1, * PSI ES =*,
00520+
00525+ F8.1.* 4SI PV **, F6.1.* LB/IN.*/
00530+ * LVW **, F6.1.* IN. LHW **, F6.1.* IN. (
00535 625 F8RMAT(*INPUT AS, D, A'S, &D' F8R SECTION*, 12,+)
00540 630 F8RMAT(//*REINFØRCEMENT VALUES*/* SFCIION /
                                                                     94ULT =*, F6.3)
                                                                    AS
                                     (P*)*,8X,*D**,/,8X,*(SQ-1N-/FT-)*,8X,
00545+
               9X, +D+, 8X, +A'S
               *(14.) (SQ.[N./FT.)*,8X.*([N.)*)
00555 640 F&RMAT(15,F11.4.* (*,F6.4.*)*,F9.3,F10.4.* (*,F6.4.*)*,F9.3)
00560 670 FORMAT(1H )
COSASC
00570C INPUT LOAD PARAMETERS
00571 IF(LPT/PE-E3-5) 00T3 25
00575 100 IF(KRAND-E9-0) 60T0 102
00576 W=1000.0 $ P3=14.7 $ C3=1120.0 $ L3C=1
00577 G0T0 106
00578 102 PRINT 600
00580 READ, W. PO. CO. LOC. S
00595 IF(LØC.EQ.1) GOTO 105
00590 PRINT 605
00595 READ-ZLEN-CD
00600 105 IF(KINC-E0-1) 00T8 106
00605 PRINT 610
DOGIC READ, PSO
00615 PR=2.0*PS0*(7.0*P3+4.0*PS0)/(7.0*P3+PS0)
00620 600 FBRMAT(/*INPUT W.PO.CO.LOC.S***)
00625 605 FBRMAT(/*INPUT L.CD***)
00630 610 FORMAT(/+INPUT PS9+++)
00640C * INPUT ROSM-FILLING PARAMETERS *
00645 106 IF(KRF.EQ.0) 6070 20
00650 10 PRINT 700
00652 RH08=0.076 $ L1=.FALSE.
00655 READ.NWIN.V3
00660 AT=0$ AFRONT=0$ ASIDE=0
00665 DØ 18 I=1.NWIN
00670 PRINT 710.I
00675 READ, AA(1,1), NN(1), AA(1,2)
00680 AA(I,2)=AA(I,2)/1000-0
00685 AT=AT+AA(I,1)
00690 M=NY(I)$ G3T9(12,14,14),4
00695 12 AFR@NT=AFR@NT+AA(I,1)
00700 G8T9 18
00705 14 ASIDE=ASIDE+AA(1,1)
00710 18 CANTINUE
00715 AFRONT=AFRONT/ATS ASIDE=ASIDE/AT
00720 700 FORMAT(/*INPIT NEIN AND ROOM VOLUME (CF)***)
00730 710 FORMAT(/*INPUT AREA (SO FT):LOCATION CODE & DELAY(MSEC)*
            * FOR HINDOW . 12.1)
00740 G=1.4 $ G2=1./G $ G3=1.-G2 $ G4=2./G3 $ G5=G+1.
00750 PP2=-1912
00755 C=SQRT(GeP2*32.*144./RH70)
00760 TAU=2.*(V3**(1./3.))/C
00770 DT=TAU/4.0
00780 20 IF(KWALL-ED-0)@178 25
00785 PRINT 86
00790 86 FARMAT(/*INPUT DELAY TIME (MSEC) TO INITIAL LOADING *. .
               *INTERIOR WALL***)
00795+
00500 READ, DELAY
00805 DELAY=DELAY/1000-0
00810 25 CALL CHAIN(RCW4LL2)
00815 99 STOP
00820 EAD
OOR25 SUBROUTINE WINDOW (QMULT-ZLV-ZLM-ZLV W-ZLM W-AMIN-AWALL-R-ICASE)
028300
00835C: THIS SUBROUTINE DETERMINES THE STRUCTURAL
00840C: MODIFICATION FACTOR FOR WALLS WITH WINDOWS
00842 IF(ICASE-GT-4-AND-ICASE-NE-10) GOT8 320
```

```
00845 RWWS=7LVW/7LV
00850 RWWL=7LHW/7LH
00855 RAREA=AWIN/AWALL
00860 IF(R-LE-1-5) G3T9 300
00865 IF(RWYS+GT+0+7) 51T7 300
00870 IF(RWAL-LT-0-5)6973 300
00875 IF(RWWS-EQ-RWWL)G0T0 300
008800
008950: CASE WHERE LV/LH >= 1.5, LV::/LV <= 0.7, AND LH W/LH >= 0.5
008900: (BIJT LVW/LV NRT EDUAL TR LHW/LH)
00895 7MILT==5.85461-12.66444RAREA+4.396624RWKS+0.848434RWL
00900+
                        -0-2734R-1-072694(ZLVWZLHW)++0-9+6-595424EXP(RAREA)
00905 G3T3 315
009100
00915C: CASE WHERE AVE AR MARE OF ABOVE CONDITIONS IS NOT MET
00920 300 0MULT=0.62022-2.23415=RAREA==(RWH_==4)-0.79461=RWHL==2
                          -2-27663*RWML+0-62522*RWML/RAREA**0-3
 00930+
                           +2.63043*EXP(RAREA)-0.09269*RWS
00935 315 CANTINUE
00940 RETURN
00945C
00950C 3NE-WAY ACTION WALLS
00955 320 24ULT=(AWALL-7LV+7LHW)/(AWALL-AHIN)
00960 RETURN
01000 SEGMENT ROWALLS (INPUT. SUTPUT)
                 THIS SEGMENT CALCULATES THE RESISTANCE FUNCTION AND LOADING AND SOLVES THE DYNAMIC EQUATIONS OF MOTION
010100
010200
01030C
01050 C3443N KWALL+KINC+LDTYPE+KRF+KR4ND+TI4E+1+YK100>+0+7H1V+YFAIL+
01052+
                  ZLV. ZLH. TW. PV. FPC. FDY. ICASE, NABAR. ASC 4), APSC 4), DC 4), DPC 4), FDC.
                  SC, ES, R, QLP, ALPR, AREA, 74955, 74ULT, VFAIL, ZKL4, V41, V42, VV1, VV2, W, P3, C0, L3C, S, ZLEN, C0, PS3, PD3, PF, PEXT, PC, TC, TO, DFLAY,
01054+
01054+
                  NWI N. RHJJ. VJ.LI. AA(4.2). NN(8). AFRINT. ASIDE, G. 62, 13, G4, PP?, DT
01058+
DIOTE CHANN / RAND/ TIMEC
CORDINATION OF THE TOTAL CORDINATION OF THE CORDINA
01100C
01250 IF(KINC.NE.1.9R.LDTYPF.E2.SICALL FARCE(1)
                        IFCKRAND. NE. 13 GST3 35
01260 14
01270
                         CALL FURCE(4)
                         CALL RANDOM(1)
CALL RANDOM(2)
01280
01290 34
01300 35
                         CALL RESIST(3)
01310C
01320C: MINIMUM, MAXIMUM, AND STARTING VALUES ARE DETERMINED / 3R CASES
01330C: WHERE THE LOAD CAUSING INCIPIENT COLLAPSE IS TO BE FOUND 01340 13 IF(KINC+E9+D) 0378 23
01350
                           PF=QU
01360
                           PF4AX=0
01370
                           PFMIN=PF/2.0
31360
                         6319 20
01390 16
                           PF=(PF4IN+PF4AX)/2.0
01400 20
                        CALL FORCE(2)
01410 23
                         IF(KRF.E0.0) G3T9 24
01420
                         CALL FILL (PINT. 2)
01430C
01440C: INITIAL:2E VALUES FAR BETA METHAD (8ETA = 1/6) AND CAMPUTE VALU
01450C: FOR FIRST TIME INTERVAL ASSIMING WALL INITIALLY AT REST
01460 24
                          1 = 1
01470
                           TI 4E=0
                         T(1)=0$ V(1)=0$ Y(1)=0
01490
                           100-0=ATJG
                         IFCKWALL.ED.O) GTTO 29
01520
01530 27
                         IF(TIME.GE. (DELAY-0.00001)) G313 28
01540
                         AT JEC+3 MIT = 3 MIT
01550
                         CALL FILL(PINT. 3)
01560
01570 25
                         00 TO 27
                         PIN(1)=PINT
01550
                         TPVET=AREA PINT
01590
                         T(1)=TIME
01600
                         G9 T9 30
01610 29
                         CALL FORCE(3)
01620
                         TPVET=AREA+PEXT
                           PV(1)=PEXT
01630
```

وسندين جه

The rest of the second section of the second section of the second section of the second section of the second

```
01640 30
          CALL REGIST(S)
01650 4(1)=T=VET/(/4495#24L4)
01660 VV(1)=VVI+TPNET
01670 V4(1)=V414TPVET
21.6300
DIAGOO: PRICEDURE FIR ALL SHESFO JENT TIME INTERVALS
01700 1
            1=1+1
01710 IF(I+LT+31)()T# 11
01720
           PRINT 94, TIAE
01730 99 F32MATC/#1=311
                         TIME #1. F4.3. * FAILURE ASSUMED ID NOT OCCURA
01740
           (JT3 6
01750 11
           TI -E= TI 4E+ 912, TA
01760
            T(1)=T14E
01770
            A(1)=A(1-1)
01750
           CALL FRECE(3)
01790
            PEX(I)=PEXT
01300
           IF((.ALL. ED. I)G) TJ 10
           TECCRESCONGATA 3
01810
014:29
           CALL FILL (PINT. 3)
01830
            P14(1)==[4]
01340
            TP42T=4RE4*(PEXT-PINT)
01450
             GOTTO P
01960 3
            TPNET=AREA*PEXT
           GSTS 2
CALL FILL(PINT+3)
01370
01830 10
           PIV(1)=PIVT
01390
01900
           TPVET=AREAPPINT
01910 2
            PHCLD# [PHET/AREA
01920
            29 3 11=1+10
01930
             Y(1)=Y(1-1)+U引TA+V(1-1)+N乳T3+N乳TA+(A(1-1)/3++A(1)/6+)
01940
            CALL PESIST(2)
01950
            OT=O+AREO
01960 4 ANEW=(TPNET-OT)/(ZMASS+ZKLM)
21972
            A' ILTA=ANEW-A(1)
01980
            ACT DEAVEN
01945 IFCAMEN. - 7.07 PRINT, +1947+, TI 45, TPMET, 0T, 74355, 7(L4, Y(I), A(I-1)
01790
           IF(ABSCADELTA/(ANEW+15-10)).LT-0-01) GTT +
02000 R
            CANTINUE
            0.5 VAT 1914 -1214 -1314
02010
(1)Y.(1)A. 39. JEIT. OF TELS CSUSC
02030 2
            CANTINUE
02040
             1(1)=1(1-1)-00,T4+V(1-1)+00,T4+00,T4+(4(1-1)/3.+4(1)/6.)
02059
            0.52/((1-1)+05_TA+(A(1)+A(1-1))/2.0
02060 VVC:)=VV1+TPNFT+VV2+0T
TC+SHV+TBY9T+1HV=(1)HV 07050
020900
021000: CHECK FOR MAXIMUM DEFLECTION OR FAILURE OF WALL
021100:
          IF MAXIMIM DEFLECTION REACHED. WALL DID NOT FAIL
            1F(Y(1).LE.Y(1-1).AV" ~4(1).LE.PY(1-1)) GJTJ 6
05150
02130
            IF(Y(I)-LT-0)()T3 6
02140
            IFCTIME-DELAY-GE-0-0100 DELTA=0-002
02160
            IF(TIME-DELAY-GE-0-020) DELTA=0-005
02173
            1F(TIME-DELAY-GE-0-100) DELTA=0-010
02180
           IF(TIME-DELAY . GE. 0. 500) DEL TA=0.050
08190C
         IF FAILURE DEFLECTION REACHED. WALL FAILED
03300
           IF(Y(1) . GE-YFAIL) GJT) 7
03210
            G3 T 1 1
085500
THEITHER BRISING CAUSING THE SHUGDERS BRIVALIAN CAUSING INCIPIENT
02240C: COLLAPSE FRO CASES WHERE DESIRED
15S>JC:
           WALL DID HIL FAIL - SET PEATH TO DE
JSS60 4
           CONTINUE
112241
           TECKING CO-CO GOTO 13
           DEMINEDE
02290 36
22327 IFCPFMAX-GT-019111 16
02310 CF-2.0.PF
02320
            33T7 20
02330C:
           WALL FAILFO - SET PERAK TO PE
02340 7
           CHITTINUE
02350
            TIMEC=TIME
02370
           IF(KINC. EQ. O) GOTO IN
02330 37
           PF4AX*PF
          CHECK IN SEE IF LOAD RANGE IS WITHIN DESIRED ACCURACY
US390C:
02400 17
            IFCCPPMAY-PFMIN)/PFMIN.GT.O.01)GTT 16
```

The state of the s

```
IFCKRAND-NE-1360T3 18
02420
             CALL RANDSM(3)
02430
32440C
02450C: BUTPUT DATA INCLUDES THE MAKIMUM DEFLECTION AND TIME OF C2460C: BUCCURANCE FOR A MON-FAILING WALL OR THE TIME AND VELOCITY 02470C: AT COLLAPSE FOR A FAILING WALL. BPTIONAL BUTPUT IS THE MADOC: ENTIRE BEHAVIOR TIME-HISTOPY OF THE WALL.
0.4900
UZBOOC: BUTPUT LOAD DATA
              CALL FORCE(4)
02510 19
J2520C
02530C: BUTPUT FINAL RESULTS
02540 IF(Y(I).LT.YFAIL)PRINT 70,Y(I).T(I)
Uasso IF(Y(I).GE-YFAIL)PRINT 71.T(I).V(I)
02560C
02570C: CHECK TO SEE IF ENTIRE TIME-HISTORY OF WALL IS DESIRED
02580 PRINT 72
02590 READ.4
05600
               IF(4-E0-0) 0010 25
02620
             IF( < WALL - EQ - 1) (2) 13 32
             1F(4RF. 50.0) 9778 26
02630
02640 PRINT 75.(T()).PEX()).PIN()).PN()).Y()).VV()).VH()).J=1.[)
02650
               G9T9 25
02660 26 PRINT 76. (T(J).PEX(J).A(J).V(I).Y(J).VV(I).VH(J).I=1.I)
             GRTS 25
02680 32 PRINT 76.(?(J).PIN(J).#::>>V(J).Y(J).VV(I).VH(J).J=1.1)
02690 25 PRINT 77
02700 STAP
0271 OC
02740 TO FRRHATC/+ WALL DID WIT FAIL - MAX. DEFLECTION SF+F6-2
02750+
            . IN. REACHED AT+F7.3. SEC+)
02760 71 FARMATC/+ WALL FAILED AT+. F7.3. * SEC (FINAL VELBCI:5 **
02770> F7.20 14./SEC)*)
02750 72 FBRMAT(/015 TIME HISTORY OF WALL DESIRED (YES=1, MO=0)***)
02500 75 FBRMAT(15X*PRESSURE ON WALL**)
02510+ *INTERIOR NET DISPLACEMENT VV VM*/
           (F6.3.3F10.3.F12.4.F11.0.F8.0))
02820+
02830 76 FORMATI/* TINE PRESSURE ACCELERATION VELOCITY *
02840+ *DISPLACEMENT VV VM*/
          ODI SPLACEMENT
                                          VH#/
           (F6.3.F9.3.F12.1.F12.2.F12.4.F11.0.FR.0))
02850+
02860 77
             FBRMAT(///, 7(a------))
92870 80 F3RMAT(/*ACCELERATION NOT CONVERGING AT TIME ***F6-3**
02880* * SEC (PF ***F7-3** PSI)*/* 4(I) SET EQUAL
                   FR. 1.0 (AVG AF LAST 2 ITERATIONS) #/0 Y(1) #0,
FR. 1.0 (AVG AF LAST 2 ITERATIONS) #/0 Y(1) #0,
FR. 4.0 [N.0)
02690+
02900+
02960 999
               STJP
02970
             END
10000 SUBREUTINE FORCE(IENTRY)
         THIS SUBROUTIVE INPUTS THE LOAD PARAMETERS AND DETERMINES THE LOAD AT A GIVEN TIME FOR THE FOILDWING LOAD TYPES:
100100
100200
100300
              1. IDEALIZED BLAST LOAD (FRONT OR SIDE FACE)
100524
          ZLV. ZLK. TH. PV. FPC. FDY. I CASE. N3BAR. AS( 4). APS( 4). D( 4). DP( 4). FDC.
          EC. ES. R. ALPR. ALPR. AREA. 24ASS. QUUL T. VFAIL. 7<L4. VHI. VH2. VVI. VV2. W. P3. CB.L8C. S. ZLEN. CD. PSB. PDN. PP. P. PC. TC. TO. DELAY.
10054
10056+
          WEN, MARO, VO.L 1, AA(8, 2), WICE), AFRENT, ASIDE, G. CO. CO. CA, PP2, DT
10658+
 10060 DIMENSIAN TT(19).PP(19)
 100400
 10130 IF(LOTYPE-EG-5) COTO SOU
10140C
10150 GRT#(2:5,200,300,4), IENTRY
110000
         CALCULATE LEAD PROPERTIES FOR GIVEN PEAK PROSSURE
110100
11030 200 GOTE(205,210),LOC
11040 205 PS8=(PR-14.0+PS+SQRT(196.0+P8+P8+196.0+P8+PR+PR+PR))/15.0
11050 BOT# 215
 11060 210 PSA-PR
11070 215 PD0+2.5+PS0+PS0/(7.0+P4+PS0)
110R0 U=C#+SORT(1+0+(6+0+PS#)/(7+0+P#))
11090 TO-W-0-3333/(2-2399-0-1556-PS8)
11100 0873(220,225),LBC
11110 220 TC=3.0*5#U
11180 PU-PS8-(1-TC/TO)+EXP(-TC/TO)+PO8+(1-TC/TO)++2+EXP(-2+TC/TO)
```

サイス 大学の大学の大学のない 一の一般などのなったのないないないないないないないないできます。 カラ・ストの

With the second second

```
11139 00=1+0
11140 4-1144
11150 225 TA=7L-W/ I
11140 TA2=TA/2.0
11170 71010=142/10
11130 PARPSIK (1-TARTO) * SXPC-TARTOD * COT * CO
11199 RETURN
120000
                  LALC LATE LIAU
120130
12030 300 GTT1(305, 314), L4C
12040 335 TEDETIME/19
1 /350 IFCTIAFARTATORITA 320
13363 6466-646-444-3-669-663846
12070 RET 241
19080 310 IT. 4CFL4F-14237TO
1204" [FC[14F. IT. [4) G)T1 320
12100 PaPA+T[47/].
12119 RETURN
12120 320 15(519,05,1,0)5911 330
 1 / 1 % | 0 2 0 5 14 ( 1 - 17 | ) + 4 5 0 ( - 7 10 ) + 6 0 + 0 3 1 + ( 1 - 7 10 ) + 0 - 4 4 7 1 - 2 4 7 10 )
 10150 WET 144
12149 939 8-1
1 21 70 PF1 JAN
1.30000
13010C PRISE 1, 140 1414
13920 4 [FCC[40.70.1131[1 490
17039 PRI 11 440.1 ) TYPE
13040 3117 410
13050 400 PRINT NAME STYPE
13070 415 G173(427) 425) L1C
13040 420 PRINT 650
13090 GST8 430
 1 1100 425 PHINT 455
 13110 430 PRINT 440, 40 PT. CT
 PRITTER TO STAND A FEBRUARY
 13130 9779(435,449), LJC
 13140 435 PRINT 445, S. TF.P-
 13150 9377 445
 13150 440 PPINT 570, "LF4, TA, PA
 13170 445 PRINT 475, 1.70, CU. PC1, P11
 ISTSO GETHER
 13500C
13500 (LA4) 1785 -- ARHETARAY LIAN SHAPE
 135300
                   INPUT LIAD DATA
 135490
 13550 510 PRINT 640
 17540 4540, 423147, (TTC 1), 20(1), 121, 493141)
 13570 FACT19=1.4
 13580 IFCCING. FOLODGETT SIR
 13590 PMAK=PP(1)
 13400 03 515 J#2,4F3;4T
13510 515 JF(PPCI).GT.PMAC)PMAC#PPCI)
13620 518 PC#PP(2)-PP(1)
  13530 (4=(T(2)-TT(1)
 13640 13×1
13640 3ET-IP4
 136670
 134700 CALCINATE MAXIM M LIAD
  13613 593 FACTAREPRIPHAT
  13693 5318 314
  1 1700 45 5044
  13710C
  13720C CAUC LATS LIAI
  13773 530 1907[45+6++170]1+1))63[] 53)
  17749 11+11+1
  13750 P(2PP( | 1+1)-PP( | 1)
  13740 TERTSCIP-13-TECTIS
  13745 IFCTS-53-0)TK=15-10
  | 1370 GIT3 530
| 13740 535 P#FAUTJ4*(PPC||1)*(||45-T](||1))*PX/TY)
  1 7790 261 174
  133300
```

```
13310C PAINT LAAD DATA
13315 549 IF(KINC.EQ.1)PRINT 640, LUTYPE
13820 IFC-INC.ED.O'PRINT 645.LDTYPE
13525 PRINT 690
13930 DR 545 I=1.4PRINT
13840 P=F4CT9R*PP(I)
13950 545 PRINT 495, TT(1), P
13960 RETUPN
14090C
14010 500 FORMATC/+[ NPHT W.P3 . 39.L3C, 5+,+)
14020 605 FORMAT(/*INPUT L.CC+++)
14060 630 F3R44T(/+INPUT PS7+++)
14070 640 FRRMATC/-LIAN -USING INCIPIENT FAILURE IS AS FALLIMS:...
14071- /.5K.-LIAD TYPE NUMBER-.12)
14040 645 FORMATC/ PROPERTIES OF LOAD ACTING ON WALL ARE AS FULLOWS: ..
           /.SY. . LJAD TYPE NIMBER. 12)
14090 650 FARMAT(BR. + (FRANT FACE) +)
14100 655 FORMAT(BX. *(SIDE FACE)*)
14110 660 /3RMATC10X. ** **. FH. 1. * KT
                                                P3 30, F6.2, 6 PSI
            F7-1.0 FP50)
14111+
14120 645 F9RMATC10X.+5 4+.F6.1.+ FT
                                                   TC = . F6.3. . SEC
           F7-3/4 PS(+)
14121+
14130 670 FORMATCIOX. . ... F6-1. FT
                                                   TA =+. F6.3. + SEC
14131+
            F7.3.4 P514)
14140 675 F2R4ATC10X.+U =4,F7-1.+ FPS
            F3RMATC10X.*U =4.F7.1.* FPS T0 =*.F6.3.* SEC F5-1./.8X.*PS3 =*.F7.3.* PS1 PD8 =*.F7.3.* PS1*)
14141+
14150 680 FRANTCHINDUT NUMBER OF LIAD POINTS AND THE TIME AND ..
            *PRESSURE AT EACH PAINT*)
14151+
14160 690 FARMATC/10X. . TIME
                                         PRESSURE®1
14170 695 FBRMAT(F15.3.F12.2)
15000 END
20000 SUBMOUTINE FILL (PO. 124TRY)
20010C: COMPUTES AVERAGE AIR PRESSURE IN ROOM DUE TO BLAST WAVE
20020C: INCIDENT HEAD- 3N UPAN FRANT WALL.
200300
20050 C3543V KWALL, KINC, LDTYPE, KRF, KRAND, TIME, 11, Y(100), Q, QU, YU, YFAIL,
20052+ ZLV. ZLM. TH. PV. FPC. FDV. I CASE. NJBAR. AS( 4). APS( 4). DL( 4). DP( 4). FDC. 20054+ EC. ES. R. ALP. ALF2. AREA. ZMASS. GMULT. VFAIL. ZALM, VM1. VM2. VV1. VV2.
20056+ WP8.C3.L3C.S.TLEN.CD.PS3.PD3.PR.PEXT.PC.TC.TO.DELAY.
20058+ WHI.RHES.V3.L1.AA(9.2).NY(R1.AFR3YT.ASIDE.G.G2.G3.G4.PP2.DT
20090 LIGICAL LILLELS
200950
YFTV31.411.61.0139100 00105
20110 10 RFTURN
20310C
20320 13 P30-P3
20330 TT=0.5 T8=0.
20340 RH338=RH38
20350 L2**FALSE* $ L3**FALSE*
20360 RETURN
20370C
20380 11 IF(L1) 09T8 52
20355 IF(L2-A-L3) @ 78 9
20390 52 DDT=(TI4E-T3)+0.5
20395 ISTOP=2
20400 53 IF(DDT+LT+DT;G9T3 51
20410 50 DDT=0+5+00T
20415 ISTOP-2-1STOP
20420 GB T0 53
20430 51 CBYTINUE
20440 DB 99 1=1-15T3F
20450 TT=T8+1=DDT
20460 IFCTT-GT-10) GB TB 99
20470 D4=G. S WED. S NEO
20410 DE 500 4-1. WHIN
20470 M=WY(4) 3 DLY=AA(X+2)+0+000001
20500 IF(OLY-GE-TT) 08 TO 500
20510 GET#(15,16,16);4
20520 15 CDP#1-0
20530 IF(TT-TC)20, 20, 21
20540 20 PII=(TC-TT)+(PR-PC)/TC+PC
20530 P11-Pi1+P0
20560 OE T9 30
20570 16 CDF#+S+4
```

and the second

的故事,我们就是一个一个,我们是一个人的,我们也是一个人的,我们就是一个人的,我们就是一个人的,我们也是一个人的,我们也是一个人的,我们也是一个人的,我们也是一

and the second of the second s

The supplication of the su

```
20400 21 PRITTED $ 48:1.+2
2061) P0=P03*4RkaPkFYP(-2, ka)
20620 P5=P63*RRk=(P(-2)
20430 PITERS+CORKED
20610 PI1=PI1+P1
20650 30 RH31=RH31*((P11/P3)**GZ)
20660 (F(P11-P34)36,34,37
          151 GV=-1
20630 L2=+TR<sup>+</sup>FR,
20770 303 P2=F11
20730 PH32=((P2/P23)**H2)*RH33)
20790 X=P34/RH333
20810 37 1316N=+1
20320 306 PC-PP2*P11
20830 RH72=((P2/P11)**G2)*RH11
20849 Y=P11/R431
20850 38 U22=G4*(X-P2/R432)*32.*144.
20360 (FCU22) 40, 39, 39
29370 40 PATNE . #1122 NEGATI VE* , 1122
20840 ST72
20990 94 US=$081C 1883*15160
20990 904=988H38*44(*1)*09T
20910 D4=D4+0D4
20320 4w#+ I+P11*DD4/(G3*2401)
20425C
20930 500 CONTINUE
20940 P39=P33+(G-1+)+PW/V3
20950 P4939=R4339+D4/v3
20960 99 CANTINUE
50+10 L1=11
20930 P3=P33-P7
20982 IFCTIME.GE.TOIL3=. IRGE.
20993 RETURN
20944 9 H=TIMENTO S RP=1+0-R
20985 PU=PU3*RR*RR*EXP(-2+0*R)
20996 PS=PS3*RR*EYP(-R)
25947 P3=P5+P0*(AF7)NT-0+4*ASTOF)
20990 999 RETURN
30000 54953311AE SEZIZI (19418A)
300100: THIS SHABUTINE IMPUTE THE PEDUTED TALL DATAS DETERMINES THE 300200: RESISTANCE FUNCTION. TRANSFORMATION FACIORS, AND REACTION 300300: COEFFICIENTSS AND SUPPLIES THE REACTION VALUES FOR SPECIFIC 300400: DEFUTCOLONS REDUIRED IN THE DYNAMIC ANALYSIS
30045C
30050 C74474 Krall, KINC, LUITPE, KRF, KRAND, TIME, L, Y(190), D. OU, YU, YFAIL,
30052+
30054+
         ZLV. ZLH. TM. PV. FPC. FDY. I CASE, NOBAR, AS(4), APS(4), D(4), OP(4), FDC.
         SC. ES. R. ALP. ALPZ. AREA. ZMASS. DMULT. VFAIL. 7 KLM. VHI. VMZ. VVI. VVZ.
         W.P3.C3.L9C.S.ZLEN.CD.PS3.PD3.PR.PEXT.PC.TC.TO.UQLAY.
30056+
         NHEN, 8499, 13. LI, AAC3, 2), NVCB), AFRJYT, ASEDE, G, G2, G3, G4, PP2, DT
30058+
30100 REAL N. IC. I G. MM. (<1.4/2,443, MJ(4), ICR(4)
301356
30140 G173(4,500,45),1547RY
30150 4 PETHEN
307900
30842C
30950 45 4=55/50
30900 F4=4.0*539T(F0C)
30917 CALL COFFCICASES HAS ASSOCIATE RESIGNAL VICTOR PROVINCION FOR 10
30920 44=2.0+1G=(FR+PV/TV)/TU
30325 CALL MAMENTIFUC, FOY, ES, N. PV. 1. O. AS, APS, D. DP. AU, I CR. IC)
31470 6411=411(2)/41(1)
31 43 OC
314990: DETERMINE PASITION OF YIELD LINES AND INTIMATE RESISTANCE 315000: CORRECTIONS FOR TWO-WAY WALLS
31510 IF(ICASE-GT-4) 6513 106
31520 711=40(4)/40(2)
31530 213-41((3)/41(1)
```

AND THE PROPERTY OF THE PROPER

Service and the service of the servi

```
PROGRAM RCWALL (CONTINUED)

31540 GAMMA12=2-0e50RT(1-0+ZII)
31550 GAMMA2=2-0e50RT(1-0+ZII)
31550 GAMMA2A=2-0e50RT(1-0+ZII)
31550 GAMMA2A=2-0e50RT(1-0+ZII)
31590- GAM
                                                                                    31750+ -ALP+GRAT+SQRT(G4U))++2)
                                                                                    31760 GOTO 105
                                                                                    317700
                                                                                    31780C: DETERMINE MEMENT AND DEFLECTION CUEFFICIENTS
                                                                                    31790C: FOR CRACKED PORTION OF WALL BEHAVIOR
                                                                                    31800 106 8=0
31810 108 IF(PV-EQ-0)GBT# 180
31820 CALL CBEF(ICASE, R. ASSC-9SSC-AFC, BFC, IC-ZLV-ZLH-PV-'X, CF-EC-2)
                                                                                    31830 G8T8(195,195,195,195,112,115,120),[CASE
                                                                                    31840 112 QUTER*=1.0/(BSSC+ZLV)
                                                                                    31850 GBT# 195
                                                                                    31860 115 GUYER4=(1-0/BSSC+(7LV+7LV+PV/(EC+1C))+4U(3)/(MU(1)+(1-0
31870+ -C0S(0-5+7LV+S9RT(PV/(EC+1C)))))/(LV
                                                                                    31850 CF*BFC
                                                                                    31890 00T0 195
                                                                                    31700 180 0UTERM#(1.0+0.5*MU(3)/(MU(1)*CAS(0.5*ZLV*SQRT
                                                                                    31910+ (PV/(EC+[C)))))/(BSSC+[LV)
                                                                                    31920 CF=BFC
                                                                                   31930 GGTØ 195
31940 180 ASSC=ASS$ AFC=AF
31950 GGTØ(195,195,195,195,185,190),ICASE
31960 182 QUTERM=1.0/(83S*ZLV)
                                                                                    31970 GOTO 195
                                                                                    31980 185 OUTERM#(MU(3)/MU(1)+1+0)/(855#ZLV)
                                                                                    31990 GBT9 195
                                                                                    32000 190 GUTER4+(0.5+MU(3)/4U(1)+1.Q)/(855+ZLV)
                                                                                    32010 195 @ 73(200,210,210,210,200,210,210),1CASE
                                                                                    320200
                                                                                    32040C: * DETERMINE RESISTANCE CURVE FOR WALL * 32050C: * (3 IS IN UNITS OF PSI, KK IN LR'CU-EN-, AND Y IN INCRES) *
                                                                                    32070C
                                                                                    32080C: CASES 1 AND 5
32090 200 01=MM/(8550ZLV0ZLV)
32100 KK1=EC+IG/(A550ZLV0+4)
                                                                                    32110 Y1=01/4K1
                                                                                    32120 KK2=EC+1C/(ASSC+7LV++4)
                                                                                    32130 IF(ICASE-EU-5) 00T0 205
                                                                                    32140 QU=QUTERM+MU(1)/(ZLV+ZLH+O+S+QUTERH+PV/KK2)
                                                                                    32150 GBT# 208
                                                                                    32160 205 QU=QUTER***U(1)/ZLV
32170 208 YU=QU/K-C2
32180 G3T8 280
                                                                                    321900
                                                                                    32200C: CASES 2, 3, 4, 6, 4 7
                                                                                    32210 210 01=44/(BF+ZLV+ZLV)
                                                                                    32220 KK1=EC+16/(AF+7LV++4)
                                                                                    35530 A1=01\K41
                                                                                    32240 92=MU(4X)/(CF+7LV+7LV)
32250 KK2=EC+1C/(AFC+7LV++4)
32260 Y2=92/KK2
                                                                                    32270 KK3=EC+1C/(ASSC+7LV++4)
```

"一个不是自然的

The state of the second second

```
32230 IF(ICASE-GT-4) G1[1 215
322+0 1) J= 20TERM*(410(1)-PV*(78-22/33)/2)/(7LV*7LH+0+5*20TER4*PV/33)
323CO G3TA 220
32310 215 74=74TER4#49(17/2LV
3232( 220 YU=Y2+(74-72)/443
32330 230 1F(24.4E.U)YEV=44(1)/(P4*(1.0-3))
32350C: CHECK FOR TYPE OF FAILURE - LIGHTLY WEINFORCED OR CONVENTIONAL
32360 IF(MHC1).LT.1.5*MM) G0 F3 288
32370C
39390C: CONVENTIONAL TYPE FAILURE
32399 YFAIL=Y J*0.1/(AS(1)/O(1))
324000: DICTILITY FACTOR MUST RE <= 30
32410 TF(YFAIL-6T-30.7*YU/FAIL=30.0*YU
32430 GATT 285
32440C
324500: LICHTLY RELIEFROED TYPE 3F FAILURE
         THE FOLLOWING EXPRESSION IS BASED ON A SIEEL PLONGATION OF 202
32440C:
32470 238 10855=30.
32480 (PUSIC3EF#SORT(FDC)
32490 ABAR=2-14159#(N13AR/14-)##2
32500 390 YFAIL=STRTC(0.2*ARAPERDY/10-167( 1/2.) **?-(7LV, 2.1**2)
3ペラレン スペン エドじゃんりょいのりにて できっ
3252001
32530C: IF FAILURE DEFLECTION DUE TO INSTABILITY IS LESS THAN VALUE
32540C: BASED IN REINFARGEMENT, SHASTITUTE THIS VALUE FOR YEATL
32550 IF(/FAIL.GT.YFV)YFAIL=YFV
32566 OFALL=JU=(YFV-YFALL)/(YFV-YH)
32570 G3T3 299
32580 295 OFALL=JH
32590 293 C3NTENUS
32600C
326100: MIDIFY RESISTANCE VALUES BY WINDOW MIDIFICATION FACIDA
38650 01#01#04/TL
32640 0H=314341&T
32650 OFAIL = OFAIL + THILE
38660 ፈና1=ናና1*ጋዛኒፎፕኝ (ና2=ናና?*ጋዛ ዲፐና (ና3=ናና3*)4 ቪፐ
326700
32642C: 39TPHT LIAN-DEFLECTION CHAVE
32670 IF(<8449.57.1) BIT3 335
32700 PPINE 450
32710 [FCICANE-EQ-1-3R-ICASE-EQ-5) [3173 320
32720 PRI IT 660,01,41,02,42
32730 6377 330
32740 320 PRINT 660, 91, Y1
32750 330 PRINT 660, 9U, YU, 9FAIL, YFAIL
32760 335 CANTINUE
32779C
32790 CALL TRANS (9,7LV, ZLH, I CASE, KRAK, ZKL 4SE, ZKL4FE, ZKL4P, V415, V425,
32790 VV15, VV25, V41F, V42F, VV1F, VV2F, V41P, V42P, VV1P, VV2P)
32810 RETURN
323200
32830C: ********************************
32379C
32430 500 IF(Y(I). RE-YFAIL) R3T3 540
32490 IF(Y(I). RT-YH) R3T3 540
 32700 01T1(501, 520, 520, 520, 501, 520, 520, 520) (CASE
32910 501 CTVITAE
329200
 38930C: FLASTIC RANGE -- CASES 1 AND 5
 32940 74L4=24L4SE
32950 V41=V415 $ V42=V425
32960 VV1=VV15 $ VV2=V425
32970 IF(Y(I)+GT+Y1)GTT3 >10
32990C: UNCRACKED PARTION -- ALL CASES
33000 505 9=Y(1)*441
33010 RETURN
330200
33730C: CRACKED PARTIAN -- CASES I AND 5
```

<u>Militaria estimplas sumisualis estas asuados pau</u>

```
33040 510 Q±Q1+(Y(I)-Y1)+(QU-91)/(YU-Y1)
33050 RETURN
33060C
33070 520 IF(Y(1).GT.Y2)@T3 530
330806
33090C: FLASTIC RANGE -- CASES 2,3,4,6,7
33100 ZKLM=ZKLMFE
33110 VM1=VM1F $ VM2=VM2F
33120 VV1=VW1F $ VV2=VV2F
33130 1F(Y(1)-LT-Y1) G9T0 505
33135C: CRACKED PARTION -- CASES 2, 3, 4, 6, 7
33140 q=91+(Y(1)-Y1)+(Q2-Q1)/(Y2-Y1)
33145 RETURN
33150C
33160C: ELAST?-PLASTIC RANGE -- CASES 2, 3, 4, 6, 7
33170 530 Z4L%=Z4LMSE
33180 VH1=VH1S $ VH2=VH2S
33190 VV1=VV1S $ VV2=VV2S
33200 0=02+KK3+(Y(1)-Y2)
33210 RETURN
33220C
33R30C: PLASTIC RANGE -- ALL CASES
33240 540 ZKLM=ZKLMP
33250 WH1=WH1P $ VH2=VH2P
33260 VV1=VV1P $ VV2=VV2P
33270 IF(PV+GT+O) GDT3 550
33250C: YO INPLANE FORCES
33290 Q=9U
33300 RETURN
33310C: WITH INPLANE FORCES
33320 550 Q=QU=(YFV-Y(1))/(YFV-Y())
33330 RETURN
33350C: WALL COLLAPSED - NO RESISTANCE (TO AVOID NUMERICAL DIFFICULTIEES 33360C: FOR CERTAIN CASES SET RESISTANCE EQUAL TO VERY SMALL VALUE)
33370 560 Q=1E-10
33380 RETURN
333900
33530 650 F8RMAT(//+LGAD-DEFLECTION CURVE+,/,3X,+9 (PSI) 33550 660 F6RMAT(F9-2,F12-4)
                                                                                                Y (14.70)
33570 DID
35000 SUBROUTINE MOMENT(FDC+FDY+ES+M+PY+B+AS+APS+D+DP+MU+ICR+IC)
35010C THIS SUBROUTINE DETERMINES THE ULTIMATE MOMENT CAPACITY AND
35080C CRACKED MOMENT OF IMERTIA FOR REQUIRED SECTIONS
35040 REAL+: 42+K3+KUD+N+IC+ICTOT+MU(4)+ICR(4)+AS(4)+APS(4)+D(4)+DP(4)
35050C
35060C: DETERMINE VALUES OF CONCRETE PARAMETERS
35070 45 K1=0-94-FDC/26E3
35070 45 K1=0-94-FDC/26E3
35080 42=0-50-FDC/8E4
35090 K3=(3900-0-0-35-FDC)/(3E3+0-82+FDC-FDC+FDC/26E3)
35100 EPSC=0-004-FDC/65E5
35150C1 **********************************
35190C
35200 11=08 1CT67=0
35210 DB 170 I=1.4
35220 IF(AS(I)-E9-0)GBTB 170
35230 11=11+1
35240C: ALL PROPERTIES ARE COMPUTED FOR A WIDTH B 35250 TENS=AS(1)+FDY+PV
35260 IF(APS(1)-LE-0) GOTO 150
35270C
35280C: WALL HAS COMPRESSION REINFORCEMENT
35290 C=(1=(3+FDC+BDP(1)
35300 TEM1=0-5=(TENS/APS(1)+ES+EPSC)
35310 TEM42=ES+EPSC+(TENS-C)/APS(1)
35380C: DETERMINE LOCATION OF NEUTRAL AXIS
35330 IF(TENS-LE-C) (010 140
35340C
35350C: KND > D.
35360 FPS=TCRM1+K3+FDC/2+0-SQRT((TERM1+K3+FDC/2+0)++2
35370+ -(TERM2+ES+EPSC+K3+FDC))
```

name and and and and and a second of the contraction of a planting of the contraction of

أخارات ويترار والمتناسب

language property lighted through

RESERVATION OF THE PROPERTY OF

```
353400: F'S 445T 9F <= F0Y
35340 [F(FPS+L[+F0Y)G)]1 130
15407 FPS=FDY
35410 130 TPS=APS(E)*(FPS-K3*F9C)
35420 410=( PENS-TPS)/(41*43*F3C*3)
35420 41([]=(TFNS-TPS)*(3([)-42*410)*TPS*(0([)-10([))
35440 1C9(1)=R#4(ID##3/3-0+V#A5(1)*(U(1)-4/ID)*#2
35450+ +(4-1)4APS(1)4((-ID-5P(1))**2
35460 6211 152
35470C
3543-IC: (II) < 9*
35490 140 FRS=-TERM1+8341(FRKM1+42-TERM2)
355900: F15 MUST 4F <= FUY
15510 IF(FPS-LT-FD() G) [7 145
357/0 FOR=FOY
35530 105 1EMM3=TENS+APS(1)*FPS
35540 (MD=TERM3/(K1*K3*FDC*A)
35550 40(1)=T57434(0(1)-(2+(0))-APS(1)+FPS+(0(1)-0P(1))
35540 [CP([)=B#KID##3/3+N#45([)#(D([)+KID)##2+N#4P5([)#(DP([)+KID)##2
35570 9413 152
assoon: Wall has in Chappessing Reinfarcement
35610 MICED TRNS*(C1*C34FDC*H) 35610 MICED TRNS*(DC1)-(2*C10)
35620 1CR(1)=H*(IJD**3/3+D*V*A5(1)*(9(1)-(IJD)**2
35640 152 | CT1T=| CT7T+| C=(1)
35650 170 CANTINUS
356690
RSATOC: DETERMENE AMENAGE CRACKED MANENT DE ENCATEA
15640 175 10410131/11
3 1640 3FT 144
15700 END
ADDO STRADITING COEFCICASE, R. ASS, ASS, AF, AF, I. T. V. ZLH. PV. NY, CE.
40010+
          THIS SUBSTITUTE DETERMINES MOMENT AND DEFLECTION CORRECTIONS
FOR THE SALES (CASES 5-7) AND THE CHARGE (1-4) YEAR THE FOR
40020C±
400300:
40040C
49050
             REAL I. MPR. MPRSO, NI
40060
             IF(IENTRY-E7-2)G1T1 200
40070
40030
              IFCICASE- GT- 4) MTT 50
40090C
40100
40110
              コンニアモコ
              R3=R+R2
40120
              R4= 92+ 82
40130
              ASS=-+007030++013990*R-+003456*R2++000256*R3
              8551-+058332++139314+P-+035699+R2++G03015+R3
401.40
              R3 (3(41,20,30,40),1CASE
40150 3
401616
401 700:
          CASE 2. FIXED IN FAUR SIDES
40130 20
             V = 3
              AF=-.003430+.007327*R+.003365*R2+.0006646*R3-.00004766*R4
40170
40200
              RF=-.101150+.260875+R-.138942+R2+.034677+R3-.004016+R4
40210+
             000170+2**5
40220
             CF=-.1674+.3554+R-.1714+92+.0296+33
40230
              G3T3 41
40240G
402530:
          CASE 3. FIXED TH SHIPT STUES. STAPLY SUPPRETED BY LONG SIDES
49269 30
              AEXE
49270
              AF=+004513-+017525#2++023095#22-+010325#83++002197#84
          -.0002208-4**5 + .00000H408*R**6
40230+
40290
             RF=-.122149+-3:3445+R--153979+42+-036192+R3--004015+R4
40300+
         ** 000164694955
             CF=2-1958-7-7564=R+10-8376=R2-7-2495=R3+2-344=R4
40310
40320+
                -. 29544R445
10330
              G7 T7 41
40340C
40350Ct
          CASE 4. SIMPLY SUPPRATED BY SHRRT SIDES, FIXED BY LONG SIDES
40360 40
40370
              AF=-.002765+.004652+R-.00569H+P2+.001829+R3-.0002559+R4
49340+
         ··00001739++++5
              95=-.060320-.256515-8-.175649-92-.057928-83-.009227-94
40390
40400+
           · • 0000$49•9••$
```

Son the comprehensive and any experience of the following structures of a suppose in the son t

```
40410 CF=5.8987#R-1.6669-7.9398#R2+5.3142#R3-1.7623#R4+.2313#R4+5
40 40 0C
40430 41
            1F(R. GT. 2. 0) CF41.0/12.0
            IF(PV.FO.O) RETURN
40440
            ARATI 7= AF/ASSS
40450
                             BRATI 3 = RF/BSS
40450
            9F9=BF$ CF9=CF
40470
            G8 T8 220
40480C
40490 50
            IF(PV-NE-0) 60T9 309
40500C: CASE S. BYE-WAY STAPLY SUPPORTED WALL,
           ASS=5.0/284.0
40510
40520
             BSS*0-125
40530
             90T3(270,270,270,270,270,60,70),1C' ;E
40540C
40550C:
         CASE 6. ONE-WAY FIXED END WALL
40560 60
            AF=1.0/384.0
             BF=1.0/12.0
40570
40580
            CF=1.0/12.0
40590
            VX=3
40600
           RETURY
40610C
40620C1
         CASE 7. BNE-WAY PROPERPED CANTILEVER WALL
            AF=1.0/185.0
BF=0.125
40630 70
40640
40650
            CF=0-125
40660
            4X = 3
40670
            RETURN
40650C
40690 200
           IFCICASE-GT-47 98TC 300
40700C: DETERMINE ELASTIC DEFLECTION AND MAMENT CREFFICIENT FOR 40710C: TWO-WAY WALL WITH INPLANE FORCES
40720 220 PI=3-14159165
40730
             4U=0+3
40740
           PE=4.0ePi=Pi=Eei/(?Lv=?Lv=(1.0-NU=NU))
40750
             8V=0
40760 230
            AV=0
40770
             PPE-PV/PE
40 75 0
             TERM6= 4. 0.PI.PI.R. SORT(PPE)
40790C
40500C:
         SERIES SELUTION USED TO DETERMINE COEFFICIENTS
40510
             00 250 4=1.7.2
40520
             MPREMOPIAR
             4PRSDaMERes2
40530
40540
             (MSQ+MPREQ+2.00MPR0PI45GRT(PPE)
             EMSQ=MPRSO-2.0+MPR+PI+SQRT(PPE)
40650
40860
             TERMS=MOMPRSGO(MPRSQ-4.00PIOPIOPE)
             C3 SH 042=0+5=(EXP(0+5+50RT(0459))+EXP(-0+5450RT(0459)))
406 70
             IF(E459-LT-0) 0018 240
40550
40690
             COSHEM2=0.50(EXP(0.50SQRT(EMSQ))+EXP(-0.50SQRT(EMSQ)))
40900
             00T9 245
             C0 SHE42=C0 S(0.5+SORT(+5450))
40910 240
            AV=AV=(1.00 "MSQ/C85HG42-GMSG/C85HE42)/(40TER46))
1)00((4-1)/ /TER45
40920 245
40930+
40940
             BV=BV+(4PRSU+(0450+(10+5450-4PRSQ)/C354E42-E45Q+(14+0450
40950+
               -4PRS0)/C3 SHG42)/(4+TER46))+(-13++((4-1)/2)/78845
40960 250
             CHATTAILE
409 70C
40980C:
         CASE 1
            AVSS=AV+(1.0-NU+NU)+R4+4.0/PI
40990
             BVSS=BV+F2+4+0/PL
41000
             IF(ICASE-E9-1) OFT# 260
41010
41020C
41030Cx
         CASES 2. 3. AND 4
           AVF=AVSS+ARATIA
41040
41050
            BVF=BVSS+BRATIA
41060
            CF=CF3+BVF/RFA
41070 258
           AF=AVF
41050
            SF=BVF
41070 260
          ASS=AVSS
41100
            855=8V55
41110 270
           RETURN
41120C
41130C:
         SYE-WAY WALLS
41140 300 EIPV=E+I/PV
```

The second second of the secon

```
HERLUISORT(FLPV)
41150
            42=0.544
41160
41170
            TERM1=1.0/C38(-02)-1.0
41140C
411900: CASE D. BNE-HAY STRPLY SIPPBATED WALL
41200
            9441111837 =228
41210
            ASS=(BSS-0-125)/-1642
            G11(270, 270, 270, 270, 270, 310, 320) . ICAS-
41220
41230C
          CASE 6. THE-WAY FIXED END WALL
41250 310 NX=3
41260 HF=(1+0-1/2/TAN(1/2))/U+*2
            AF=- HF+ 955+455
41277
41240
            RETHIN
41290C
          CASE 7. ANE-WAY PREPRED CANTIL EVER WALL
41300C:
41310 320 VY=3
            35=[AV(U)*(TAV(U2)-U2)/(U*(TAV(U)-U))
41320
            AF=(9F+(0.5.5[4(42)/TAV(4)-C)5(42))-(5[4(42)/TAV(4)
41330
41340+
               -C35(1)2 -5[4(1)2)/$[V(U)+0.125*U*U+1.0]/J**2)/U**2
41350
            RETURN
41360 999 END
50000 51983UTINE TRANS (5, ZLV, ZLH, ICASE, 4RA4, Z4L 4SE, Z4L 4FE, Z4L 4P, VLIS, 50010+ VL2S, VSIS, VS2S, VLIF, VL2F, VS1F, VS2F, VL1F, VL2P, VS1P, VS2P)
500300
50040C: THIS SUPRRUITINE DETERMINES LUAD AND MASS TRANSFERMATION FACTORS
SOOSOC: AND DYNAMIC REACTION CREFFICIENTS FOR TWO-WAY MALLS.
57060C
SOO YOU: DETERMINE LEAD AND MASS TRANSFORMATION FACTORS
            32=B+B
50040
50090
            33=8+82
            94=92+92
50100
             35=32493
50110
50120
            96=93+93
501300
SOLADCE CASES 1 4 5 -- FLASTIC RANGE
50160
             7(LSC1=6-4+92+(1-/6-32/10-+93/30-)
50170
50130
             34LSE2=0.64-0.8134+4
             HARSI=9*(1./12.-82/15.+83/42.)/(1./6.-92/10.+83/30.)
50170
             94952=(0-127093-0-194524+3)/(0-4-0-509333+3)
50200
             Z445E=Z445E1+Z445E2
 20210
50220
             7KL SE#74LSE1+7KLSE2
             1F(4RA4.EQ-1) GTT3 335
50230
50240C: CRACK PATTERN A
             CV5=0.549
             CVL=0.50(1.0-4)
50260
             XP=7LH+9/3.0
50270
             XBARS=BARS1+ LH
 50230
 50290
             ZP=ZLV+(1.0-4.0+R/3.0)/(4.0+(1.0-H))
ZBARS=RARS2=ZLV
50300
             XBARP-O. S.B.ZLH
50319
             ZBARP=ZLV+(1./24.-9/16.)/(1./4.~9/6.)
 50320
50333
 50340C: CRACK PATTERN B
 50350 335
             CVS=0.50(1.0-8)
 50360
             CVL=0.5+3
             XP=2LH+(1.0-4.0+9/3.0)/(4.0+(1.0-8))
 50370
 50340
             444528445544
 50340
             7P=?LVeR/3.0
             ZBARS=BARS1+ZLV
 50400
             KRARP=71.H=(1./24.-8/16.)/(1./R.-9/6.)
 50410
 50420
             *#49P#0. 5# 9#71.V
               LMSERZKMSE/ZKLSE
 50430 339
             GTT#(3+0, 340, 350, 360, 390, 340, 473), I CASE
 50450
 50460C
50470C: CASES 2. 3. 4 4 -- ELASTIC RANGE
50490 350 IF(<RAC+E2+1)9373 365
             @T3 340
 >0490
 50500 360 IF(KRAK+59+0)GFTJ 365
 505100: CASES 26 28, 34, 48, 6 6
50520 340 Z44+- 512.0+85+(1.0/30+B/10+5+3++82/24+-83/18++84/90+)
50530 *4LFS, 32.0+H3+(1+/12+-8/10++82/30+)
```

provide the second section of the second second

A STATE OF

```
BARF1=8=(+05-8/15+82/42+)/(1+/12+8/10+82/30+)
50540
            G3T3(370, 365, 370, 370, 370, 365), I CASE
50550
50560C: CASES 2A, 28. 38, 4A, 4 6
50570 365 ZKMFE2=0+4065-0+6144*R
50580
            74LFE2=0.5344-0.7328+B
50590
            BARF2=(+091667-+138095+9)/(+266667-+366667+B)
            Q3T3(375, 364, 375, 375, 375, 36R), I CASE
50600
50610C: CASES 2A 4 29
50620 368 ZKMFE=ZKMFE1+ZKMFE2
            ZKLFE=ZKLFE1+ZKLFE2
50630
50640 G9T7 380
50650C: CASES 3A 4 4B
50660 370 ZKMFE=ZKMFE1+ZKMSE2
           ZKLFE=ZKLFE1+ZKLSE2
50670
50680
            G0 T0 380
50690C: CASES 3B, 4A, 4 6
50700 375 244FE=2445E1+244FE2
            ZKLFE=ZKLSE1+ZKLFE2
50720 380 ZKLMFE=ZKMFE/ZKLFE
50740
            G773 390
50750C: CASE 7
50760 470 ZYLMFE=0+78
50770C
50780C: ALL CASES -- PLASTIC RANGE
50790 390 244P=(1.0-9)/3.0
50800
            7KLP=0.5-9/3.0
50510
            さくしMPuこくMPノこくしP
50820C
50630C
50840C: DETERMINE DYNAMIC REACTION COEFFICIENTS FOR SHORT (VS) AND
SOBSOC: LONG (VL) EDGES
50560C
50670
            IF(ICASE-LT-5) GOTO 395
50860
            XBARS=1E-10$ BARF1=1E-10$ XBARP=1E-10
50590 395 CANTINUE
50900
            G3 T3 (450, 400, 400, 420, 450, 400, 445), [CASE
50910 400 IF(KR4K+E0+1) G3T3 410
50920
            XBARF=BARF1+ZLH
            IF(ICASE-EQ-3) 08T8 430
50930
50940 405
           ZBARF=BARF2*ZLV
           GOTO 440
XBARF=BARF2*ZLH
50950
50960 410
50970
            1F(1CASE-50-3) GOTO 435
           ZBARF=BARF1+ZLV
50980 415
50990
            G8T8 440
51000 420 IF(KRAK-EQ-1)(9172 425
51010
            XRARF=BARS1+ZLH
           GST8 405
XBARF=BARS2+ZLH
51020
51030 425
            GST8 415
51040
           ZBARF=BARS2+ZLV
51050 430
51060
            G3T3 440
51070 435
51080 440
            2BARF=BARS1+ZLV
           CONTINUE
51090C
51100C: CASES 2, 3, 4, 6 6 -- ELASTIC RANGE
51110 VS1F=CVS+(1.0-YP/XRAPF)
            US2F=CUS+(XP/XBARF)
51120
            VLIF=CVL+(1.0-ZP/ZBARF)
51130
            VL2F=CVL+(7P/2BARF)
51140
51170
            G8T9 450
51150C
51190C: CASE 7 -- FLASTIC RANGE
51200 445 VS1F=0
            VL1F=0-459
51220
            VL2F=0-165
51210
51250C
SIRGOC: CASE I & 5 -- ELASTIC RANGE
51270 450 VS13+CVS+(1+0-XP/XBARS)
51250
            VS2S*CVS*(XP/XBARS)
51290
            VL15+CVL+(1+0-2P/2BARS)
51300
            VL25=CVL+(ZP/ZBARS)
51340C
51350C: ALL CASES -- PLASTIC RANGE
```

```
21340 460
             VSIP=CVS+(1+0-(P/XPARP)
             VESP=CVS*(XP/XR/1RP)
51370
51359
             VL1P=CVL+(1+0-7P/7BAPP)
             VL2P=CVL*(ZPZZBARP)
RETURN
51390
51 400
21417
70 000
             CYCTUSI) MEDIAG SMITHERFU
TOOTION THIS SUBRATITIVE LIVELIES MEAN AND STANDARD DEVIATIONS FOR KONDAM
TOOSION VARIABLES: RENERALES KINDAM VALUES: AND CONTROLE PEOULED
                                         AND DITPUTS FINAL RESILTS AND SUMMARY
        VIMBER DE CASES TO RE RING
70040C
70.050 C34434 < 4LL+<14C+L3[YPE, <RF+<444D+T14E+1+Y(100)+9+3U+YU+YF4TL+
          /L v, /L 4, Th, PV, FPC, FDY, I CASE, N39AR, 45(4), APS(4), O(4), OP(4), FOC,
70052+
70054+
         EC. FS. R. ALP. ALP2. AREA. MASS. TAULT. VFAIL. TKLM. VHI. VH2. VVI. VV2.
70056+
          SAPA, CALLACAS, CLENACIDA PSA APIDA APRA PEXTAPO, TOATO, DELAYA
          NWIN, RHIT, VI, LI, AACR, 2), NNCR), AFRINT, ASIDE, G, G2, G3, G4, PP2, DT
70053+
70030
            C34434 /RAND/ TIMEC
70099
             DIMENSION CHI25(7), CHI975(7), TOIST(7)
70100C
70110C VALUES FOR 97.5% (F=19.24.29.34.39.44.49)
             DATA CH125/ 4639 . 5167 . 5533 . 5425 . 6065 . 6267 . 6440/
70120
             94T4 CH1975/1.7295.1.6402.1.5766.1.5244.1.4903.1.4591.1.4331/
70130
70140
             DATA TRIST/2-093, 2-064, 2-045, 2-032, 2-022, 2-014, 2-010/
70150C
70160
             5717(5,50,70), I ENTRY
70170
           5 X019992=YV3R91(-1+0+6+0+1+0)
70180C INITIALIZE RANDAM NUMBER GENERATAR
             PRINT, / . * INPUT NRAND*,
70190
70200
             READ, VRAVD
70210
             D7 47 1=1. NHAND
70220
             X01M4Y=XN3R41(0+0+0+0+1+0)
          47 CINTINIE
70230
70240
             DEESASS SUBSESSED SUBSESSED
70250
             I CHECK=20
70260C
70270C
          INPUT MEAN AND STANDARD DEVIATION FOR RANDOM VARIABLES
70290
70293
             PEAD, SYEAV, SSD
          PETNEDROFO CONCRETE WALLS
70410C
             PRINT 46
70420
        30
70430
             READ, FDYMEAN, FDY SO
             PRINT 96
70440
79450
             RETURN
70460C
70470C
          GENERATE RANDAM VALUES
70570
             FDY=XN7RM1(0.0.FDYMEAN, FDYSD)
              IF(FDY-LE-0)GTT 50
70580
70 53 5
              IF(SMEAN-EQ-O) JATA 65
70590
              S=XNARMI (O.O. SMEAN, SSD)
70 600
              IF(S+LE+0) mT3 60
             I + X 3 C V I = X 3 C V I
70610
        65
 70420
              RETURY
70630C SIM VALUES OF PSD AND PSD**2 FOR USE IN STATISTICAL ANALYSIS
             SPS3=SPS3+PS3
70640
         70
70650
              59953±55953+653+653
70660C
70670C 31TPUT FINAL RESILTS
70730 76 PRINT 92.FDY, S. PS9. TIMEC
        40 IF(INDEX-LT-ICHECK) RETURN
70 740
 70 750C
70760C DETERMINE MEAN, STANDARD DEVIATION, AND STANDARD ERROR FOR PS9
77777
              7V1:IVDEY
70 730
              /4FAN= SPS3/7N3
 70 790
              SOF SORT (CSSPS9-5N3+7MEAN+7MEAN)/7N3)
70800
              STDERR=SD/(SORT(248-13)
TORIDO CHECK IF MAXIMUM OF SO PSO SAMPLES ORTAINED
70930 TFINOEX-ED-50 0973 42
70930 CHECK IF 95% CONFIDENCE INTERVAL FOR MEAN PSO VALUE IS
705 40
             IFCSTDERR*TDISTCCINDEX-15)/5)/24EAN-GT-0-10)G0T0 61
70550C
709-90C CONFIDENCE INTERVAL IS AITHIN 10% -- DETERMINE UPPER LIMIT OF TORFOC 95% CONFIDENCE INTERVAL FOR STANDARD DEVIATION TOUGHOOD PROBABILITY VALUE AND ITS 95% CONFIDENCE INTERVAL UPPER LIMIT 70890 62 SDU=SD/(SORT(CHI25(CHIDEX-15)/5)))
```

PROGRAM RCWALL (CONCLUDED)

THE LANGE OF THE PARTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PARTY OF THE PARTY

```
20900C CHECK IF MAXIMM IF SO PSI SAMPLES INTAINED
70990 CHECK IF IPPER VALUE IF 954 CINETURING INTERVAL FIR STANDARD
70930C DEVIATION IS VITHIN 0.10*4EAN OF THE STANDARD DEVIATION
           1 F ( ( ( SO 1- SU) / * 4EAN) + GT + 0 + 10 ) G7 T7 41
709500
70999.
THOROC AND TOR AND TO PRINTINGLY PALLIES
       71020
           745A4/1=745A4+5106R4+T015TCC1405X-15)/5)
           501=50/(5037(041975((14054-15)/5)))
71031
           P10=14EAV-1.232450
71041
           PIOL=74FAV-1.232#509
71050
           P10-1=74FAN-1-242451%
71060
           P70=74EAN+1.242450
71070
71040
           PFOLESHEAM+1.242450L
71077
           P97=7474V+1.24945D
           P30 1= (4F44+1.242= 500
71100
           P301J=74E44+1+232+501
71110
71120C
711300 1 IP-HT STATISTICAL PARAMETERS OF INCIPIENT CALLARSE PROSCHES
           PRINT 100, 74EAN, 74EANL, 74EAN I, 50, 50, , 50%, PIO, PIO, PIO,
71149
71150+
             PIGERIOLEPIOI
71140
           PRINT 105/1905X/STORAR
           6)13 949
71170
711300
711900 954 CAMPIDENCE INTERVAL IS NAT MITHEN 104 FRE HATH MEAN AND 90
712207
TIRING VALUES -- THEREFARE THATAIN IS ADDITION IN SAMPLES
71220
        61 104504=104504+5
1133)
           451944
71 2400
71270 36 FIRMATC/#INPUT MEAN AND STANDARD DEVIATION FOR FOREST
      RT FIRMAT( / * [ NPIIT MEAN AND STANDAW) ) EVITTIN FOR 54.+)
71240
       90 F794AT(F9.2.F11.2.F10.2.F14.3)
71290
       92 FARMAT(F9.1.F11.2.F10.2.F14.3)
71319
       96 F3R4AT(///, 5x, *F)Y*, 7x, *S*, 8<, *P$3*, 6<, *C3LLAPSE T142*)
11350
71360 100 F344AT(////11x, *STATISTICAL PRINCATES 35 [VC[P[SV] PS3*, 71379+ //, 39x, *955 CIVETDENCE LIMITS*, /, 7x, *1154*, 14x, 11340+ *VALUE LJ WER UPPER*, //, * 454V*, F23*, 2,
              2F12.2.//. * SIANDARD DEVIATION*. F15.2.2F12.2.//.
71320-
             • 10% PR3BABILITY VALUE. 3F12.2.///
• 90% PR3BABILITY VALUE. 3F12.2)
71400+
71410+
7:420 105 F3RMAT(//, SK, +N:MRER JF 34SERVATI INS =+, 13, /, 5%,
71 430+
             *STANDARD ERRIR #*.F5-2)
71 440C
       199 STIPS FVD
71450
71460 FUNCTION XVIRMICS A. B)
71470 IF(K)10.20.20
71440 10 X0=RANF(-1+0)
71490 20 KI=RANF(0.0)
/1500 (2=RANF(0+0)
71510 Y=SORT(-2.0*AL 19(X1))*(C35(6.243144*X2))
7: 520 KN1941=4+Y+4
71530 RETURN
71 340 END
```

CARLES OF THE PARTY OF THE PART

RCSLAB

Reinforced Concrete Slab

PROGRAM RCSLAB

The second secon

```
00100 PROGRAM RCSLAB1 (INPUT, JUTPUT, TAPE1)
00105 CALL RETRETRESLABS, THRESLABS)
DOI10C * THIS PORTION OF THE PROGRAM INPUTS THE REGULARD SLEMENT AND DOI1SC: LOAD DATA AND INITIALIZES CERTAIN PARAMETERS *
001200
00150 C34431 (INC.LDTYPE, CRF. CRAND, TIME, I. Y (RO), G. QU, YU, YFAIL,
00152 - 7LS, 7LL, HS, PV, FPC, FDY, ICASE, NJAGG, G5(4), GPS(4), D(4), DP(4), FDC,
         EC. ES, R. ALP. ALPZ. AFEA. MASS. VFAIL. MLV. VI. 1. VLZ. VSI. VSZ.
00154+
         MEMB. ASQ., ASCS. VCL. VCS. ASS. BSS. AF. BF. CF. NY.
90155+
         W. Pa. Ca. Lac. S. TLEN. CD. PSA. PDA. PR. PETT. PC. TC. TQ. DQ. AT.
         06159+
GG140 LAGICAL LI
001850
DOI TUE: READ TITLE AND CONTROL PARAMETERS
00175 PRINT 67
COISC READ SHITTLE
OG190 READ. KINC. LATYPE. KAF. KRAND
00195 DELAY=0
80200 YFAIL=1E10
DO205 67 FARMATC/#INPUT TITLE***>
(PEA)TAPHET 88 01500
nosis as emanaticationit kincoldtres, kap, kaadki = qavo343+, + ?
00234C
00236 4 58 5 1=1:4
00238 AS(1)40
ORE40 5 CENTINUE
005:120
ODEANT . INDIT AND ECHO CLAR AND RELYFURCEMENT PROPERTIES .
00246 PRINT 615
GOZAS READ, TLS, ZLL, HS, FPC, FOY, 1 CASE, NARAR
00250 FOC=1-25+FPC
00252 EC-57619+0+59RT(FPC)
00254 ES#29E6
CO256 AREA=!L5#?LL
00256 EC419-EC/10000 ES419+ES/1090
00260 R#7LL/1LS
BUSGE ALPS 1.0/RS ALPS ALPS ALPS ALPS
UDR64 IFCICASE-LE-47 GBT3 11
00266 R-05 ALP=05 4LP2=0
G1268 11 PRINT 670
06270 93 8 1=1.4
00272 PRINT 625.
00272 PRIVI 6232

00274 READ.AS(1).D(I).APS(I).DP(I)

00276 IF(I.4E.1) GBT3 3

00278 GBT3(9.9.8.9.9.7.7).ICASE

00280 3 GBT6(9.8.7.6.9.9.9).ICASE

00282 6 IF(I.EQ.3) GBT8 9
 00284 GFT# 5
00284 7 1=1+1
 OORS & CONTINUE
00292 PRINT 711
00294 READ-4048
 DORSE IFCHESB. NECT OFTE 15
 00300 IF(ICASE-GT-4) GBT8 13
 00302 PRINT 701
 00304 READ, ASCS, ASCL
 00306 ASQL=ASQL/12-0
 00306 GBT8 16
00310 13 FRINT 706
00312 READ, ASCS
 00314 ASCL=0.0
 00316 16 ASCS=ASCS/12-0
 003180
 003206: **********************************
 00322C: * DETERMINE DEFLECTION AND MOMENT COEFFICIENTS *
 003260
 00328 15 24ASS+150+0+AREA+HS/(354+07+1728+0)
 00330 PRINT 620. ICASE. ZLS. ZLL. MS. FPC. FDC. ECCIP. FDY. ESCIP
 00334 DE 110 I=1.4
 00336 IF(AS(1)-E3-0)GPT3 110
```

And the state of t

name a secondario de desta de desta de desta de desta de la company de desta de la constanta della constanta de la constanta d

. 大学学

and the second s

```
59332 Pag(()/(12.9c)()) $ PPage(()/(12.0c)())
00346 PRINT 645, 1, ACC1), 0, 0(1), 4PS(1), 9P, 0PC(1)
00342C CHANGE WHITS OF REINFORGENENT FROM SQ. IN. ZET TO CC.
00344 $5(1)245(1)/12.0 $ 4P5(1)±4P5(1)/12.0
00346 110 CANTINUE
 0-23480
 $9359 9CL>8+24853RT(FPC)/(1-2#9(1)/ZLS)+3000+(AS(1)/0(1))/(i-)(1)/ZLS)
00351 VCLMAC#3-5459RT(FPC)/(1-0-2-0+001)/ZLS)
00357 (FCVCL+GT+VCLMAK)VCLMVCLMAK
00353 (FC)CASC+GT+GTT+ 30
99354 VG5+2+24+53+[(FPG)/(1-2+9(9)/?LL)+3003+(45(2)/9(2)\/(1-9(2)/?LL)
09755 VC#MAX=3.54598T(FPC)/(1.0-2.040/2)/7LL)
  > 1354 EFCVCS+8T+VBS4AK) VBS= JBS4AK
 37757 PRIOT 647 VOL. VOS
20 354 GJTS 35
 27340 30 PRINT 595.VOL
OC 142 25 CENTENDE
00364 GALL CSERCICASS, 4, ASS, 45, AF, AF, 0, 0, ZLS, ZLL, PV, 47, CF, EC, 1)
00364 GALL CSERCICASS, 4, ASS, 45, AF, AF, 0, 0, ZLS, ZLL, PV, 47, CF, EC, 1)
00366 GS GRAMAT( *14-)T ENUL, 45, FROM SECTION (12, 1)
00376 GS GRAMAT( *14-)T ENUL, 45, FROM SECTION (12, 1)
00376 GS GRAMAT( *14-)T ENUL, 45, FROM SECTION (12, 1)
00376 GS GRAMAT( *14-)T ENUL, 45, FROM SECTION (13, 1)
                           # SIMPLET [476 410 m. 12 p. p. | 10 m. 10 
 *$7860
 23376+
 16474.
                            * P$1+,5X,450 =+,F7.1.+ 4514,/,* FUY =+,F4.1.+ PC14,
 44380+
                            345#35 ###F4ali* (SI*)
77332 633 C3-44T(//*REINF)RCEMENT YALUESH/* SECTI)4 45 (P)*,
00344- 94:*94:R4:*45 (P'!*-44:*0'*-/:3(.*(5) [N-/F])*-104.
09394+
                            *(14.) ($2 14./#T)*.104.*([4.)*)
17344 548 F34441(17,F11,4,4 (4,F5,4,4)4,F3,3,F10,7,4 (4,F6,4,4)4,F9,3)
 20090 ATS FIRMATELY 2
77372 670 F344ATC/ey(), ze, F6.1, a PC[
                                                                                            /CC =+, F4.1. + PSI+1
 10374 ASS F3944T(/4V/2, ±4,F5.1,+ P5(4)
00398+ SHRMATCHETUPIT CHITTUDIS ACTIVITION PARALLEL TI ...
00398+ SHRMATCHETUPIT CHITTUDIS ACTIVITACEMENT PARALLEL TI ...
                       *$4341 694 ($3 [4./FT)***)
DOMNA THE EDRAGIC/OLE TERSILE MEARRANG TO HE INCLUDED CORNER.
00406+
                       *127553***
003630
 395700
                 PRETERPRA GALL TONI
77571 IFCLOTY-5-57-57 FACE LIADING CUSED IN RIGHTFILLING PRICEDURE
 00575 100 at 1000.0 $ P3=14.7 $ C3=1120.0
00574 IFCK-F. NE-13G9T$ 102
23740 L1C=1
ACT CLEDITICS TANDADAL RESULT
00584 PREST 403
00586 READ, S
00544 GTT 105
UDYNOC LACATIAN 2. THP FACE LIADING
02592 132 CD=0 $ LJC=
00594 2LRV=?LS/12+0
00690 105 1F((14C+53+1)G)[1 106
00405 PRINT 410
09410 9540.053
10415 HR=2.0+PS3+(7.0+P3+4.0+P33)/(7.0+F3+63)
00420 600 $1944T(/+14PIJT 5+++)
00430 510 F344AT(/4[ 4PIJT P534.+)
396350
00641 IGA TECCHE-20-010113 20
00641 IGA TECCHE-20-010113 20
00450 10 PRINT 700
 17458 8433±0.774 4 1.1±.FALSE.
00653 35.4Y+1510
00655 3550+NetN+V3
70660 AT*US AFRANT=05 ACIDE=1
00665 98 14 I=1.4WIN
00670 PRINT 710.1
20675 READ.AACL.13.NNC13.AACL.23
0.0001\($.1)PA=($.1)AA 0P00
00685 ATSAT+AACL.13
00620 4=44(1)$ GTT(12,14,14).4
11495 12 AFRINT=AFRINT+AA(1.1)
```

The interest of the content of the c

the contemporary in the state of the second second

```
00700 6372 14
00705 14 ASIDE=ASIDE+AA(I+1)
00710 IS [F(AA(1,2).LT.DELAY)DELAY=AA(1,2)
00715 AFRANT=AFRANT/ATS ASIDE=ASIDE/AT
20720 700 F3RMAT(/*INPI)T NWIN AND R33M V3LUME (CF)*,+)
00730 710 FARMAT(/*INPI)T AREA (SO FT),L8CATI3N CADE & DELAY(MSEC)*
00735+
          + F3R WIND3W=, (2,+)
00740 G=1.4 $ G2=1./G $ G3=1.-G2 $ G4=2./G3 $ G5=G+1.
00 750 PP2=-1912
00755 C=SQRT(G=Pa=32.+144./RH33)
00760 TAU=2.+(V3++(1./3.))/C
00770 DT=TAU/4+0
00775C
DOTRO SO CANTINUE
00810 25 CALL CHAIN(RCSLAB2)
00815 99 STBP
043 05400
00830 SUBROUTINE COEFCICASE, R. ASS. BSS. AF. AF. I. IL V. ILH. PV. NK. CF.
00532+
          THIS SUBPROUTINE DETERMINES MOMENT AND DEFLECTION COEFFICIENTS
0083401
          FOR BYE-MY (CASES 5-7) AND TWO-WAY (CASES 1-4) ELEMENTS
008360:
005350
00540
            REAL I. MPR. MPR 1, NO
00842
             IFCICASE GT. 4) (813 50
00544
00546C
DOS 48
             R2=R+R
00450
             R3=R=R2
20700
             R4=R2+R2
00854
             ASS=-+007030++013890*R-+003456*R3++000296*R3
00856
             855=-+059332++139314+R-+035609+R2++003016+R3
00555 5
             G3T9(41,20,30,40), [CASE
00560C
00862C:
         COSE 2. FIXED 3N FBUR SIDES
00848 20
             AF=+.003430+.007327+9-.003365+82+.0008646+93-.00004766+84
00666
             BF=-+101150++260875+R-+138982+R2++034677+R3-+004016+R4
00544
00570+
          0.000170***5
005 37
            CF#-.1674+.3554+R-.1714+R2+.0286+R3
00474
             GFT3 41
003767
          CASE 3. FIXED BY SHART SIDES. SIMPL" SUPPORTED BY LONG SIDES
00875Ct
00680 30
             4X = 4
00832
             AF=+004513-+017525+R++U23095+42-+G:U325+R3++002167+R4
U0554+
          .0002205*R**5 * .000005405*R**6
00866
            BF=-.122149+.313445+R-.153979+R2+.036192+R3-.004015+R4
00556+
         +.CDD1646*R**S
00690
            GF#2-1958-7-7564-R-10-9376-R2-7-2495-R_+2-344-R4
00692+
               -. 24540R005
00694
00594C
0069861
          CASE 4. SIMPLY SUPPORTED ON SHORT SIDES. FIXED ON LONG SIVES
00900 40
            VX=3
00902
             AF=-.002765+.0G%652+R-.005494+R2+:001429+R3-.0002859+R4
00904+
         * • 00001 739*R** 5
00906
             8F++ . 040320+ . 256515+R- . 1 75645+R2+ . 057928+R3- . 009227+R4
00905+
          ..000549*R**S
00910 CF=5-5957+R-1-6669-7-9395+R2+5-3142+R3-1-7623+R4+-2313+R++5
00912C
00914 41
            IF(R. GT. 2.0) CF=1.0/12.0
00916
            RETURN
009150
00920 50
            CONTINUE
00455C#
         CASE S. BNE-WAY. STAPLY SUPPRRTED
00984
            455=5-0/384-0
00926
             BSS=0-125
00925
             GBT3(270, 270, 270, 270, 270, 60, 70), I CASE
          CASE 6. BYE-WAY. FIXED ENDS
CASE 6. BYE-WAY FIXED END WALL
00930C:
00932Ct
             AF=1.0/35 .. 0
00934 60
00936
             BF=1.0/12.0
00936
            CF=1.0/12.0
00940
            E .XF
00942
            RETURN
```

er former general former for the property of t

```
009440
         CASE 7. DNE-WAY, PRIPPED CANTILEVER
00946C:
             AF=1.0/135.0
00948 70
00950
             9F=0.125
00952
            CF#0-125
00954
            4X=3
00956 270
            RETHRY
00959
            EVD
01000 SEGMENT ROSLABS (INPUT. JUTPUT. TAPEL)
010100
        THIS SERRENT CALCULATES THE RESISTANCE FUNCTION AND
        LJACING AND SOLVES THE DYNAMIC EQUATIONS OF MOTION
010300
01050 C74434 KING, LDTYPE, KRE, KRAND, TIME, I, Y(80), O, OU, YU, YEAIL,
         ZL S. ZLL. HS. PV. FPC. FPT. I CASE, N3BAR, AS(4), APS(4), D(4), DP(4), FDC.
01052+
         EC, ES, R. PLP, ALPZ, ARTA, MASS, VFAIL, MLM, VL1, VL2, VS1, VS2,
01054+
01055
         ME 18, ASCL, ASCS, VCL, VCS, ASS, BSS, AF, BF, CF, NX,
         W. Pa. Ca. Lac. S. IL SV. CD. PSA. PDA. PF. PEXT. PC. TC. TO. DELAY.
01055+
         WHY, RHOO, V3, L1, AA(B, 2), W(B), AFRANT, ASIDE, G, G2, G3, G4, PP2, OT
01058+
01076 COMMON /SAR/ SAREAS, SAREAL
01079 COMMON /RAND/ TIMEC
01080 DIMENSION A(80), V(80), T(80), VS(80), VL(80), PN(80)
011000
01250 IF(KINC.NE.1.0R.LDTYPE.ED.5) CALL FORCE(1)
            IF(KRAND. NE. 13 GOTO 35
01260 14
01270
            CALL FORCE(4)
01250
            CALL RANDS4(1)
01290 34
            CALL RAYLJ4(2)
01300 35
            CALL RESIST(3)
013100
01320C: MINIMUM, MAKIMUM, AND STARTING VALUES ARE DETERMINED FOR CASES
01330C: WHERE THE LOAD CAUSING INCIPIENT COLLAPSE IS TO BE FOUND
01340 13
            IF(KINC. E0.0) 6013 23
01350
             ロチェクリ
             PFMAX=0
01360
01370
             PEMIN-PE/2.0
01390
            G3 T7 20
01390 16
             PF=(PFMIN+PFMAX)/2.0
01400 20
            CALL FIRCE(2)
0141:) 23
            IF(<RF+E')+0)G3T7 24
01420
            CALL FILL (PINT. 2)
01430C
21440C: INITIALIZE VALUES FOR RETA METHOD (RETA = 1/6) AND COMPUTE VALU
DIASOC: FOR FIRST TIME INTERVAL ASSIMING ELEMENT INITIALLY AT REST
C1469 24
             [2]
01470
             TIME=0
01480
            T(1)=0$ V(1)=0$ Y(1)=0
01499
             DELTA=0.001
31570
            IFCKRF-NELL) GATA 30
            IFCTIME. 65. (05). AY-. 0000111 6173 30
01510 27
01520
            TIME=TIME+DELTA
01530 CALL FILL(PINT.3)
01540
            G3T8 27
01550 IF(YCI)+GE+YFAIL)PRINT 71+T(I)+Y(I)
            CALL RESIST(2)
A(1)=0+0 5 VS(1)=0+0 $ VL(1)=0+0
01640 30
01650
01660
            T(1)=TIME
114800
01690C: PROCEDURE FOR ALL SUBSEQUENT TIME INTERVALS
01700 1
01710 IF(I+LT+91)G773 11
01720 PRINT 98.TIME
01730 98 F88MATC/*[=81: TIME =:.F6.3.* FAILG & ASSUMED TO NOT BCCJQ*)
01740
            GTT9 6
TIME=TIME+DELTA
01750 11
             T(1)=TIME
01760
01770
             A(1)=A(1-1)
01775
            IF(KRF.NE.O)GITA 19
01740
            UALL FARCE(3)
01790
            PV(I)=PEXT
            GPTP 2
CALL FILL(PINT.3)
01800
01880 10
01890
            TVIG=(I)V9
01910
      S CHALLANE
01920
            03 8 JJ=1+10
```

THE STATE OF THE PROPERTY OF T

As .. We have the supplied to the supplied to

The property of the second of

```
91930
              Y(I)=Y(I-1)+DELTA+V(I-1)+DELTA+DELTA+(A(I-1)/3.+A(1)/6.)
21940
              CALL RESIST(2)
01960 4
             AVEW=AREA#(PV(I)-7)/(7MASS#7(LM)
01970
              ADELTA=ANEW-A(I)
01980
              MEYA=CI)A
01985 IF(ANEW-E0-0)PRINT, #1985*, TIME, PN(1), 9, 74455, 74L4, Y(1), A(1-1)
01990
            IF(ABS(ADELTA/(ANEW+1E-10)).LT.0.01)5373 9
02000 8
             CONTINUE
             A(I) = AVEW-ADELTA/2.0
02010
02020 PRINT 80, TIME, PF, A(1), Y(1)
02030 9
             CONTINUE
02040
              Y(1)=Y(1-1)+DELTA+V(1-1)+DELTA+DELTA+DELTA+(A(1-1)/3.+A(1)/6.)
02050
              V(1)=V(1-1)+DELTA+(A(1)+4(1-1))/2.0
02060
             VS(I) #AREA*(VS) *PY(I)+V52+7)
02070
             VL(I)=AREA+(VL1+A4(I)+VL2+3)
020900
O2100C: CHECK FOR MAXIMIM DEFLECTION OR FAILURE OF WALL
                                    LIAR TEN DIO THEMBUS (GENDA)
6 DTED((1-1)M4.81(1)M6
           IF MAXIMUM DEFLECTERY
021100:
            IF(Y(I).LE.Y(I-1).A'
02120
02130
             1F(Y(1)-LT-0)(3T2 6
             IF(TI 4E-DELAY - GE - G - 010) DELT4=0 - 002
02140
02160
             IF(TIME-DELAY. GE. 0. 020) DEL TA=0.005
02170
             IF(TIME-DELAY-GE-0-100) DELTA=0-019
02160
             1F(TIME-DELAY-6E-0-500) DELT4=0-050
021900
          IF FAILURE DEFLECTION REACHED, WALL FAILED
02200
            IF(Y(I) . GE.Y' .IL) GOTO 7
02210
             G3 T3 1
02220C
02230C: INTERVAL HALVING PROCEDURE TO DETERMINE LOAD CAUSING INCIPIENT
0224GC: COLLAPSE FOR CASES WHERE DESIRED
02250C: ELEMENT DID NOT FAIL -- SET PEMIN TO PE
            CONTINUE
02260 6
02280
            IF(41NC-52-0) G8T8 18
            PF4I N=PF
02290 36
02300 IFCPFMAX-GT-0:00T9 16
02310 PF=2.0*PF
02320
             G3T2 20
023300:
           ELEMENT FAILED -- SET PFMAX TO PF
02340 7
            CONTINUE
02350
            TIMECATIME
02370
            IF(KINC.FQ.0) GOTS 18
             PFMAX=PF
02380 37
           CHECK TO SEE IF LOAD RANGE IS WITHIN DESIRED ACCURACY IF((PFMAX-PFMIN)/PFMIN-GT+0+01) G070 16
02390Ct
02400 17
            IF(KRAND. NE. 1) G3T3 18
02410
            CALL RANDON(3)
02420
02430
02440C
02450C: BUTPUT DATA INCLUDES THE MAXIMUM DEFLECTION AND TIME OF
02460C: OCCURANCE FOR A NON-FAILING WALL OR THE TIME AND VELOCITY 02470C: AT COLLAPSE FOR A FAILING ELEMENT. OPTIONAL SUTPUT
02490CI ENTIRE BEHAVIOR TIME-HISTORY OF THE WALL.
02490C
02500C: BUTPUT LOAD DATA
02510 18
             CALL FORCE(4)
025200
02530C: SUTPUT FINAL PESULTS
0254C IF(Y(I)=LT-YFHIL)PRINT 70-Y(I)-T(I)
02550 IF(Y(1).GE.YFAIL)PRINT 71.T(1).V(1)
02552C
02554 PRINT 90
02556 READ. (FILE 02558 FF(<FILE-EQ-01G)TH 40
02560 PRINT 95
02562 READ, NAMEF
02564 CALL PFUR(34RET, 1. NAMEF)
02566 WRITE(1,) SAREAS, SAREAL, HS
02566 WRITE(1,)1
32570 WRITE(1,)(T(J),P4(J),VS(J),VL(J), I=1,I)
02574 CALL FFUR(SHREP. 1, NAMEF)
02576 40 CSATINUE
0257RC CHECK TO SEE IF ENTIRE TIME-HISTORY IS DESIRED
02580 PRINT 72
02590 READ.4
```

A STATE OF THE PROPERTY OF THE

The second second

```
02690 25 PRINT 77
32710C
02740 70 FIRMATC/*N3 FAILURE - MAX. DEFLECTION 3F*.F6.2.
02750+ * IV- REACHED*.F7-3.* SEC*)
02760 71 FERMATC/*FAILURE ECCURRED AT*, F7.3, * SEC (FINAL VELOCITY **,
02770+ F7-2,* IN-/SEC)*)
02780 70 FRR4AT(/*! TIME MISTARY DESIRED (/ES=1, NJ=0)***)
02:130 76 FRANKTIVE TIME PRESSURE ACCOLERATION VELOCITY * 02540+ #015PLACEMENT VS VI.**/*
       02340+
12540 77
2370 80 F3R* ATT/+ACCELEGATION NOT CONVERGING AT TIME ==+F6+3+
02480+ * SEC OFF ==+F7+3+* PSID+/* ACID SET FOUND TO++
                  FR-1. * (AVR OF LAST 2 ITERATIONS)*/*
FR-4, * (N-*)
                                                                Y(1) =4.
22440+
1,5470+
02930 90 F3RMAT(/AAPE REGETIONS TO BE DUTPUT TO FILE (0=N3.1=YES)+.+)
02940 999 ST3P
12970 END
10000 SUBRAUTINE FORCECTENTOYS
10010C THIS SURPRICTING INPUTS THE LIAD PARAMETERS AND DETERMINES 10020C THE LIAD AT A GIVEN TIME FOR THE SHIT AND A THOSE.
         THE LEAD AT A GIVEN TIME FOR THE FOLLOWING LOAD TYPES:
1. IDEALIZED BLAST LOAD (FRONT OR SIDE FACE)
10050 C34739 KINC.LDTYPE.KRF.KRAND.TIME.I.Y(80).9.2 D.YYD.YFAIL.
10050 ZLS.ZLL.MS.PV.FPC.FOY.ICASE.N3BAR.AS(4).APS(4).D(4).DP(4).FDC.
10054- ZC.FS.P.ALP.ALP2.AREA.ZMASS.VFAIL.ZKLM.VL1.VL2.VS1.VS2.
10054+
         MEMB, ASIR, ASIS, VILL, VIS, ASS, ASS, AF, AF, CF, NX,
         W. P3. C3.L3C. S. 7LEY. CD. P53. P93. P9. P. PC. TC. TO. D. LAY.
 10056>
          TO 1.599 169 169 169 169 169 174 677 ACRIAN (B) NY 165 11 ACRI (B) NEW 1891 1991
 10060 DIMENSION TT(20), PP(20)
 100400
10130 IF(L)TYPE-E9-5163T3 500
101430
 10150 GATO (215, 200, 300, A) - I FYTRY
 11000C
 110100 CALCILATE LEAD PREPERTIES FOR COMEN PEAS PRESSURE
 11030 200 WTA(205,210),L1C
 1:040 205 PS#=(PR-14-0+P7+SORT(196-0+P7+P3+196-0+F7+PR+PR))/16-0
 11050 G9T7 215
11040 210 PS7=PR
 11070 215 PD#=2.5+PS#+PS#/(7.9*P3+P3#)
 11080 U=C8+30RT(1.0+(6.0+F53)/(7.0+P5);
 11070 TO=#**0.3333/(2.2399+0.1596*FS2)
 11:07 (73(220,225), L7C
 11110 220 TC=3.0*S/U
 11180 PC=P50+(1-TC/TO) +EXP(-TC/10)+P01+(1-TC/TO)++2+EX8(-8+TC/TO)
 11130 CD=1.0
 11140 RETURN
 11150 225 TA=7LEN/9
 11160 TAZ=TA/2-0
 11170 TA2TO=TA2/TO
 11180 PA=PS9+(1+TA2T0)+EXP(-TA270)+CD+CD+C1+TAZT0)++2+FXP(-2+TA2T0)
 11190 RETURN
 120000
         CALCILATE LIAD
 120100
 12030 300 @T2(305,310),L3C
 12050 IF(TIME.GT.TC) F3T3 320
 12060 P=PC+(TC-TIME)+(PR-PC)/TC
 12070 PETHEN
 12100 PEPARTIME/TA
 12110 RETURY
  12120 320 15CTTO-GE-1-0) G3T8 330
  12130 P=P-3+(1-TT0)+EXP(-TT0)+C0=03+(1-TY0)+E-7=CNF101
  18150 RETURN
 12140 330 P=0
  12170 RETURY
  130000
  ATAG CAG.! TVIPS 2010E1
  13020 - IFCKING-EG-015373 400
```

The second second second second second

elementario de la manestra de la principa de la constitución de la con

```
13030 PRINT 640, LDTYPE
13040 G9T3 410
13050 400 PRINT 645.LDTYPE
13060 410 CONTINUE
13070 415 GOTO(420,425):L3C
13080 420 PRINT 650
13090 G3T2 430
13100 425 PRINT 655
13110 430 PRINT 660, W. PA. CA
13120 IFCKRAND. NE. GORETUSN
13130 GOTO(435-440)-L3C
13140 435 PRINT 665. S. TC. PR
13150 GOTO 445
13160 440 PRINT 670. ZLEV. TA. PA
13170 445 PRINT 675, U. TO, CIL. PS9, PD9
13150 RETURN
13500C
13510C LOAD TYPE 5 -- ARBITRARY LOAD SHAPE
13520 500 GOTA(510, 520, 530, 540), !ENTRY
13540C INPUT LØAD DATA
13550 510 PRINT 680
13560 READ-NPGINT-(TT(J)-PP(J)-J=1-NPGINT)
13570 FACT3R*1.0
13580 IF(KINC-EQ-0) G0T0 518
13590 PMAX=PP(1)
13600 IN 515 J=2. YPBINT
13610 515 IF(PP(J).GT.PMAX)PMAX=PP(J)
13620 515 PX=PP(2)-PP(1)
13630 TX*TT(2)-TT(1)
13640 JJ=1
13650 RETURN
13460C
13670C CALCULATE MAXIMUM LOAD
13680 520 FACTOR=PR/PMAX
13690 GPT# 518
13700 RETURN
13710C
13720C CALCULATE LOAD
13730 530 [F(TIME+LE+TT()]+1>) mg T0 535
13740 JJ=JJ+1
13750 PX=PP(JJ+1)-PP(JJ)
13760 TX=TT(JJ+1)-TT(JJ)
13765 IF(TX-EQ-0)TX=1E-10
13770 GOTO 530
13780 535 P#FACT8R*(PP(JJ)+(TIME-TT(JJ))*PX/TX)
13790 RETURN
138000
13810C
         PRINT LOAD DATA
13815 540 IFCKINC-ED-1)PRINT 640-LDTYPE
13820 IF(KINC-E9-0)PRINT 645, LDTYPE
13825 PRINT 690
13830 D8 545 J=1.NP3INT
 13840 P=FACTSR+FP(J)
13850 545 PRINT 695.TT(J).P
13640 RETURN
14000C
14070 640 FORMATC/+LBAD CAUSING INCIPIENT FAILURE IS AS FOLLOWS: +.
           /. SX. +LOAD TYPE NUMBER .. 12)
14071+
 14080 645 FORMATC/+PROPERTIES OF LOAD ACTING 31 ELEMENT ARE AS +
14051+
            *FOLLSWS: *. /. SX. *L3AD TYPE NIMBER*, 12)
14090 650 F3R4AT(94,+(F934T FACE)+)
14100 655 FORMAT(SX.*(SIDE 3R T3P FACE)*)
14110 660 F3RMAT(10X.*W =*.F8.1.* 4T P8 =*.F6.2.* PSI
14111+
            F7-1.0 FP50)
14120 665 FARMATCIOX.+S =+.F6-1.+ FT
                                                   1C = . F6.3. * SEC
            F7-3.* PSI+)
14130 670 FORMATCIOX, +L =+, F6.1, + FT
                                                   TA =+. F6.3. * SEC
14141+ F5-1://SX.*U =*,F7-1:* FPS TO =*,F6-3:* SEC CD =*
14141+ F5-1://SX.*PS3 =*,F7-3:* PS1 PD3 =*,F7-3:* PS1*)
14150 680 F@RMAT(/*INPIJT NIMBER 9F LGAD P3INTS AND THE TIME AND *,
14151+ ** **PRESSURE AT EACH P3INT**)
14160 690 F@RMAT(/10X:**TIME**)
```

一小公司的中国公司的

The William William

```
14170 615 F344AT(F15.3.F12.2)
15000 240
20000 SUBBOUTENE FILL (POLIENTRY)
SOUTH CAMPILES AVERAGE ATE PRESSURE IN RAIN DIE TA HEAST HAVE SOURCE INCIDENT HEAD-AN JEAN FRANT WALL.
20030 CIMMAN KINCILOTYPE, KRF, KRAND, TIME, TT, YCRO), O, DUY J, YFATL,
20052+ ZLS, ZLL, 45, PV, FPC, FNY, TCASE, 43447, 45(4), 495(.), 9(4), 99(4), FNG,
         50.55.0J4. ALP. ALPS. ARGA. MASS. VFAIL. KIL4. W.1. 1. 1.711. V. 2.
20054+
21155+
          4547, 450L, ASCS, VCL, VCS, ASS, RSS, AF, RF, CF, NK,
20756+ 4, P3, C3, L3C, S, ZLS4, C3, PC3, PC3, PC, TC, TC, TC, TC, DQ, AY, 20053+ NAIN, R437, V3, L1, AA(8, 2), NA(3), AFR3NI, AS(3), G, C2, G3, G4, P22, DI
20070 LIGICAL LIVERLA
200950
20100 G3T3(10,13,11),1F4TRY
203100
20320 13 PJ3=PJ
20330 TT=0.$ T3=0.
20340 94334=R483
20350 L2= FALSE . $ L3= . FALSE .
20360 RETURN
20370C
20390 11 IF(L1) 9173 52
20395 IF(L2-A-L3) GJT3 9
20390 52 00T=(TIME-T8)+0-5
20395 IST8P=2
20400 53 IF(DDT+LT+DT) (3778 51 20410 50 DDT=0+5+DDT
20415 1ST3P=241ST3P
20420 GJ TZ 53
20430 51 CJNTINUE
20440 D3 99 1=1,15T3P
20450 TT=T3+I+DOT
20460 IF(TT-GT-T0)G1 T3 99
20470 DM=0. $ 99=0. $ NW=0
20480 03 500 K=1.NHIN
20500 IF(ELY-GF-TT) G9 T3 500
20510 GaTa(15,16,16),4
20520 15 COF=1.0
20530 IF(TT-TC)20,20,21
20540 20 P11=(TC-TT)+(PR-PC)/TC+PC
20550 P11=P11+P3
20560 G3 T3 30
20570 16 CDF=-0-4
20600 21 R=TT/TO $ RR=1--R
20610 PD=PD3+RR+RR+EXP(-2.4R)
20620 PS=PS7+RR+EYP(-R)
20430 P11=PS+CDF+PD
20640 P11=P11+P3
20650 30 RH31=RH33+((P11/P3)++G2)
20660 IF(PI1-P33)36-36-37
20670 36 JSIGN=-1
20690 L2=+TRUE+
20770 303 P2=P11
20780 RH32=((P2/P3))**G2)*RH333
20790 X=F33/RH333
20800 09 T3 38
20810 37 JSIGN=+1
20420 306 P2*PP2*P11
20830 RH32=((P2/P11)++G2)+RH31
20840 X=P11/RH81
20850 38 U22=G4+(X-P2/R+32)+32++144+
20960 IF(U22)40,39,39
20870 40 PRINT. - U22 N' JATIVE + , U22
9515 OF805
20990 39 U2=S9RT(U22) # JSIGN
20900 DD4=120R-1320AA(4,1)0DDT
20910 PM=04+UD4
20920 WW=WW+P11+U04/(G3+RH21)
20925C
20930 500 CANTINUE
20940 P38=P38+(%-1-)+WW/V3
```

AND MAKE AN

是是是TMESERY

```
PROGRAM RCSLAB (CONTINUED)

20950 9H333=9H333+0M/V7
20760 99 C3NTIN'IF
20770 TJ=TT
20980 P3=P33-P3
20982 IF(TIME.GE.TC)L3=.TR'UE.
20943 RETURN
20944 9 RETURN
20944 9 RETURN
20946 PS=PSMeRReTXP(-2.0eR)
20946 PS=PSMeRReTXP(-2.0eR)
20946 PS=PSMeRReTXP(-2.0eR)
20947 P3=PS+PDM(AFRANT-0.4eGSIO
20940 999 RETURN
21020 END
30000C: DEFLECTIANS RESIST (IENTRY
30010C: DEFLECTIANS RESULT (IENTRY
30040C: DEFLECTIANS RESULT (IENTRY
30045C
30050 C3MM3N (INC,LDTYPE.KRF.KR
300545 C3ESS R.ALP.ALP.2.AREA.Z
300556 WEMB.ASCL.ASCS.VCL.VCS.
300566 PPJ.CT.L13C.S.TLEN.CO.P
300566 PPJ.CT.L13C.S.TLEN.CO.P
300566 PPJ.CT.L13C.S.TLEN.CO.P
                                               20987 P3=P5+PD+(AFR3NT-0+4+G519F)
                                               30000 SUPRRUTINE RESIST (LENTRY)
                                              30010C: THIS SUBROUTINE INPUTS THE REDUIRED WALL DATAS DETERMINES THE
                                              30020C: RESISTANCE FUNCTION: TRANSFORMATION FACTORS, AND MEACTION 30030C: COEFFICIENTS AND SUPPLIES THE REACTION VALUES FOR SPECIFIC 30040C: DEFLECTIONS REQUIRED IN THE DYNAMIC ANALYSIS
                                               30050 C34434 KINC, LDTYPE, KRF, KRAND, TIME, I, Y (80), 3, 911, Y11, YFAIL,
                                                          ZLS-ZLL-HS-PV-FPC-FDY-ICASE-NBRAR-AS(4)-APS(4)-D(4)-DP(4)-FDC-
                                                          EC. ES. R. ALP. ALP2. AREA. ! HASS. VFAIL. ! KLY. VLI. VL2. VSI. VS2.
                                              30055+ MEMB, ASCL, ASCS, VCL, VCS, ASS, BSS, AF, BF, CF, N4, 30056+ MPB, C7, L1C, S, ZLEV, CD, PSJ, PDJ, PR, PEXT, PC, TC, TO, DELAY, 30058+ NWIN, RH93, V3, L1, 44(9, 2), NN(8), AFR9NT, ASIDE, G, G2, G3, G4, PP2, DT
                                               30070 CAMMAN /SAR/ SAREAS, SAREAL
                                               30100 REAL NoTCo IG MM 441 448 443, MU(4) > ICR(4) + 4T
30130 G3T3(4) 500 > 45) > IENTRY
                                               30140 4 RETURN
                                               308100
                                              304 50C
                                               30960 45 N=ES/EC
                                               30870 FR=9.0*SQRT(FDC)
                                               30920 CALL MOMENT(FDC+FDY+ES+N+0+1+0+AS+4//S+9+DP+MN+ICR+IC)
31490 GMN=MU(2)/MN(1)
                                               31500C
                                               31510C: DETERMINE PASITION OF YIELD LINES AND ULTIMATE RESISTANCE
                                               31520C: CREFFICIENTS FR TWH-WAY SLAR
31530 IFCICASE GT. 47 GRT9 106
                                               31540 211=40(4)/40(2)
                                              31540 (11=40(47+40(2)
31550 (13=4)(3)/40(1)
31560 (444412=2+0*59RT(1+0*711)
31570 (444412=2+0*59RT(1+0*713)
                                               31590 GRAT=GA44412/GA44A34
                                               31590 B=S3RT(1+711)+(@4U+ALP2/G44434)+(S3RT(GRAT++2+3/
                                               31600+ (G11)+ALP2))-GRAT)
                                               31610C: IF BETA IS GREATER THAN 0.5 ASSUMPTION OF CRACK PATTERN A
                                               31620C: NOT VALID AND GRACK PATTERN B IS ASSUMED TO OCCUR
                                               31630 IF(B-LE-0-5)G3T# 105
                                               31 440C
                                               31650C: CRACK PATIERY B
                                               31660 KRAK=1
                                               31670 9=57RT(1+0+313)+(53RT(1+0/GRAT++2+G4U+ALP2+3+0)-1+0/GRAT)
                                               31680+ /(GMIMALP2+GAMMA12)
                                               31690 DUTERM=6.0 GAMMA12 42 ALP + GMIV (SORT (3+1/(GMI) + ALP2 + GRAT 42))
                                               31700+ -1.0/(50RT(G4IJ)+ALP+GRAT))++2
                                               31705 SAREAS=0.547LS47LL4(1.0-4) $ SAREAL=0.547LS47LL44
                                               31710 GTT9 109
                                               31;200
                                               31730C: CRAC4 PATTERN A
                                               31740 105 CONTINUE
                                               31750 4844=0
31750 111584=6+0+6444434++2/(ALP+(S08T(3+64U+ALP2+684T++2)
                                               31770+ -ALP+GRAT+SORT(04U))++2)
                                               31775 SAREAS=0.507LS07LL09 $ SAREAL=0.507LS07LL0(1.0-8)
                                               31790 6370 109
                                               31800C: DETERMINE MAMENT AND DEFLECTION COEFFICIENTS
                                               31910C: FOR CRACKED PARTIAN OF SLAB BEHAVIOR
                                               31820 106 9=0
```

Manual Control

A STATE OF THE REAL PROPERTY.

```
31825 SAHEAS=0.0 $ SAREAL=0.547LS#ZLL
31430 103 C3V(I VUE
31840 G)[1(195,195,195,195,142,145,140),1CASE
31450 142 PUTERY=1.0/(395+369)
31960 GTT1 195
31870 135 DUTERM=(MIJC3)/MIJC1)+1.0)/(RSSMZLS)
31880 GTT 195
31990 190 1UTERM=(0.5*41(3)/4U(1)+1.0)/(BSS*ZLS)
31900 195 GTT(200,210,210,210,200,210,210)+1CASE
31910C
31950C: **************
31950C
31970C: CASES 1 AND 5
31990 200 31=44/(ASS=ZLS+ZLS)
31990 441=56=16/(ASS=ZLS++4)
32000 41=31/441
32010 442=5C+[C/(A55+7L5++4)
32020 IF(ICASE-E7-5) (777 205
32030 OU=OUTERMANUCTO/AREA
32040 GOT3 204
35020 502 30=501544+40(1)\2F2
32070 6319 280
320800
32090C: CASES 2, 3, 4, 6, 4 7
32100 210 31=44/(RF+7LS+7LS)
32110 (41=EC+16/(AF+ZL5++4)
32120 Y1=01/441
32130 72=4U(4X)/(CF*?L5*?L5)
32140 <<2=EC+1C/(AF+2L5++4)
32150 Y2=92/K42
32160 447=50+10/(ASS+3LS++4)
32170 IF(ICASE+6T+4) 1 215
32190 21=0-11ERM#M-1C13/4754
32190 G3T3 220
3200 215 119=011584+414(1)/2L5
32210 220 111=120-(111-12)/443
3220 280 GANTINUS
32260 OFAIL= 29
32270 YT=999.9
322800
32290C: CHECK FAR TYPE OF FAILURE - LIGHTLY REINFORCED OR CONVENTIONAL
32300 IF(4U(1)-LT-1-5444)G3T7 293
32319C
32320C: CONVENTIONAL TYPE FAILURE
32322 IF(ICASE-ED-1-0R-ICASE-ED-5) 0077 272
32324 YE=Y2+YIP(1.0-32/711)
32326 6317 273
32328 272 YE=YU
32330 273 YFAIL=YE+0.1/(AS(1)/0(1))
32340C: DUCTILITY FACTSR MUST BE <= 30
32350 IFCYFAIL-GT-30-09YE)YFAIL=30-09YE
32370 11 300
323500
32390C: LIGHTLY REINFARCED TYPE OF FAILURE
324000: THE FALLAWING EXPRESSION IS BASED ON A STEEL FLANGATION OF 20% 32410 29% (JCDEF=30+0 32420 ) IPU=UC3EF+SORT(FDC)
32430 ABAR=3-14154*(NJBAR/16-)**2
32440 290 YFAIL=STRT((0.2+ABAR+FDY/UPU+ZLS/2.)++2-(ZLS/2.)++2)
32460C:
32470C TENSILE MEMBRANE BEHAVIOR
32480 300 IP(MEMB-ME-1) MITO 803
32530 TS=ASCS+FDY
32535 IF(ASCL-E9-0) 0019 312
32540 TL=ASCL+FDY
32550 C1=3-14159+S9RT(TS/TL)+7LL/(2-0+7LS)
32560 KT=0
32570 D3 310 JJ=1.13.4
32580 112=11+2
325R2 CJSHJJ=0.5*(EXP(JJ+C1)+EXP(-JJ+C1))
```

white the contract of the cont

The programme to the company of the programme to the company of th

```
32584 C35H112=0.5*(EXP(112*C1)+EXP(-112*C1))
32590 C2=(1.0-1.0/C2SHJJ)/JJ**3-(1.0-1.0/C3SHJJ2)/JJ2**3
32600 310 4T=4T+C2
32610 <T=1.5+3.14159++3/(4.0+<T)
32620 G3T9 314
32630 312 4T=8.0+1.5
32640 314 YT=QU+ZLS+ZLS/((T+TS)
38642 9T-8U
32644 IF(YT-LE-YFAIL)@T9 316
32646 YT=YFAIL
32646 GT=YT=KT=T3/(ZL3=ZL5)
32650 316 YFAIL-0-15-ZLS
32660 GFAIL=YFAIL+KT+TS/(ZLS+ZLS)
32665C
32670C * ADJUST LOAD-DEFLECTION CURVE FOR SLAB DEAD LOAD
32680 245 9DL=150.0*H5/1729.0
32700 IF(20L+GT+21) G1T3 292
32710 YOL=90L/441
32712 GOT3 295
32713 292 GBTR(293, 294, 294, 294, 293, 294, 294) . ICASE
32714 293 YDL=Y1+(0DL-01)+(YU-Y1)/(0H-01)
32715 IF(30L+LT+9U) 49T7 295
32716 PRINTS+9DL =+.0DL,+ 0H =+.0H $ ST9P
32717 294 YDL=Y1+(0UL-01)+(YU-Y1)/(0U-01)
32718 1F(9DL-LT-02)63TA 295 $ PRINT, +0DL =+,0DL,+ 02 =+,02 $ $T&P
32719 295 CONTINUE
32720 Y1=Y1-YDLS Y2=Y2-YDLS YU=YU-YDLS YT=YT-YDLS YFAIL=YFAIL-YDL
32725 31=91-99LS 32=32-9DLS 3U=9U-9DLS 8T=8T-8BLS 8FAIL-8FAIL-8BL
32730 IF(KRAND-NE-1)PRINT 633-90L-YOL
32750C
32760C: GUTPUT LZAD-DEPLECTIZN CURVE
32770 IF(KRAND-E9-1) (913 335
32780 PRINT 650
32790 IF(ICASE-E0-1-3R-1CASE-E0-5) G3T3 320
32800 PRINT 660,01, Y1, 92, Y2
32910 G3T0 330
32920 320 PRINT 660,01,41
32930 330 FKMEMB-E9,1163T8 332
32840 PRINT 660. THEY IN OFAIL . YEALL
32850 GET# 335
32655 338 1F(0T-4E-6U) @TO 333
32860 PRINT 660. QU. YU. QT. YT. QFAIL. YFAIL
32862 90TB 335
3864 333 Print 660.64.74.64.77.67.77.67AIL.7FAIL
32970 335 CENTINUE
328800
22890 CALL TRANS (3, ILS, ILL, ICASS, 4844, ILUSE, ILUFE, ILUFE, ILUF, W. 18, W. 28,
32900+ USIS, VS28, W. 1F, VL2F, VS1F, VS2F, VL1P, VL2P, VS1P, VS2P)
32910 35HRL=VCL+D(1)+7LL/((VL15+VL25)+AREA)
32920 IF(ICASE-GT-4) GTT3 340
32930 95HR5=VC5+D(2)*7L5/((VS15+V525)*AREA)
32940 IFCKRAND.NE-1)PRINT 690, 354RL, 954RS
32950 0010 345
32960 340 IFCCRAND.NE.1)PRINT 675.05HRL
32970 345 CONTINUE
32980 RETURN
32990C
33010C: * ENTRY 3: DEFERMINE THE RESISTANCE (PER UNIT AREA) *
                     3F THE WALL ... A FUNCTION OF YELD
33020C: *
330300: *****************************
33040C
33050 500 IF(Y(1)+GE+YFAIL)G9T9 560
33060 IF(Y(1)-GT-Yt) 6073 540
33070 @T3(501,520,520,520,501,520,520). [CASE
33060 501 CONTINUE
33090C
33100C: BLASTIC RANGE -- CASES 1 AND 5
33110 ZKL4#ZKL4SE
33120 VL1=VL15 $ VL2=VL25
33130 VSI=VSIS $ VS2=VS25
33140 IF(Y(1)+5T+Y1)9978 510
33150C
33160C: UNCRACKED PORTION -- ALL CASES
33170 505 Q=Y(1)+441
```

The other control of the second control of t

```
33130 RETURN
331900
332000: CRACKED PARTITY -- CASES 1 AND 5
33210 510 0=01+(Y(1)-Y1)+(2U-01)/(YU-Y1)
VPUTER 05288
33230C
33240 520 (F(Y(1)+9[+Y2)9777 510
33250C
33260C: BLASTIC RANGE -- CASES 2.3.4.6.7
33270 74L 4=74L4FF

33270 VL1=VL1F $ V.2=VL2F

33290 VS1=VS1F $ VS2=VS2F

33300 1F(Y(1)-LT-Y1) G3T3 505

33310C: CRACKED PARTIAN -- CASES 2.3.4.4.7
33320 2=21+(Y(1)-Y1)+(Q2-Q1)/(Y2-Y1)
33325 RETIRN
33330C
333400: BLAST3-PLASTIC RANGE -- CASES 2,3,4,6,7
33350 530 74LM=24LMSE
33360 VL1=VL1S $ VL2=VL2S
33370 VSI=VSIS $ VS2=VS2S
33390 9=92+443*(Y(1)-Y2)
33390 RETURN
33400C
33410C: PLASTIC RANGE -- ALL CASES
33420 540 Z4LM=Z4LMP
33430 W.1=W.1P $ VL2=VL2P
33440 VS1=VS1P $ VS2=VS2P
33450 IF(Y(I)+GT+YT)GJT3 550
33470 RETURN
33480C
3349GC TENSI E MEMBRANE RANGE -- ALL CASES
33500 550 000\+(Y(I)-YT)+(QFAIL-QT)/(YFAIL-YT)
33510 RETURN
33530C: ELEMENT CULLAPSED - NO RESISTANCE CTO AVOID NUMERICAL DIFFICULTIES
33540C: FTR CERTAIN CASES SET RESISTANCE EDUAL TO VERY SMALL VALUED
33550 569 7=1E-10
33560 RETURN
33573C
33633 633 F3RMAT(/*QDL =*,F6.2,* PSI YOL =*,F8.4,* IN
33700 650 F3RMAT(//*LJAD-DEFLECTI3N CHRVE*,/,3x,*2 (PSI)
                                                     YOL =+, FR. 4, + IN. +)
33710 660 F3RMAT(F9.2, F12.4)
33750 690 FORMATC/+QSHRL =+,F9.2.+ PSI
                                                        254RS =*, F9.2, * PSI*)
33760 695 F3RMAT(/*ASHRL =*,F9.2.* PSI*)
35000 SIJARAIJTINE MAMENT(FOC.FDY.ES.N.PV.A.AS.APS.O.DP.MU.ICR.IC)
35010C THIS SUBRAUTINE DETERMINES THE ULTIMATE MAMENT CAPACITY AND 35020C CRACKED MAMENT OF INFRITA FOR REQUIRED SECTIONS
35040 REAL (1,42,43,400,4,10,107)T.MU(4),1CR(4),AS(4),APS(4),D(4),OP(4)
35050C
35060C: DETERMINE VALUES OF CONCRETE PARAMETERS
 35070 45 <1=0.94-FDC/26E3
35030 42=0.50-FDC/8E4
35090 43=(3900+0+0+35*FDC)/(3E3+0+82*FDC-FDC*FDC/26E3)
35100 EPSC=0+004-FDC/65E5
351500; ****************************
35160C: * DETERMINE ULTIMATE MAMENT CAPACITY AND CRACKED * 35170C: * MAMENT OF INERTIA FOR REQUIRED SECTIONS *
35180C: *****************
35190C
35200 II=05 ICT3T=0
35210 D0 170 I=1,4
35220 IF(AS(I)-E9-0) G8T3 170
35230 11=11+1
35240C: ALL FREPERTIES ARE COMPUTED FOR A WIDTH 9
35250 TENS=AS(1)*FDY+PV
35260 IF(APS(I)-LE-0) GOTA 150
352700
35280C: WALL HAS C3 PRESSIBN REINFORCEMENT
35290 C=K1+(3+FDC+S+)P(1)
35300 TER41=0-5+(TEYS/APS(1)+ES+EPSC)
 35310 TERM2=ES+EPSC+(TENS-C)/APS(1)
 35320C: DETERMINE LACATION OF NEUTRAL AKIS
```

AND THE PROPERTY OF THE PROPER

A STATE OF THE PROPERTY OF THE

```
35330 IF(TENS-LE-C) 63T3 140
35350C: 4UD > D'
35360 FPS=TERM1+K3*FDC/2.0-SORT((TERM1+K3*FDC/2.0)**2
35370+ -(TERM2+ES*EPSC*(3*FDC))
35380C: F'S MUST BE <= FDY
35390 IF(FPS+LT,FDY)G7T3 130
35400 FPS=FDY
35410 130 TPS=APS(1)+(FPS-K3+FUC)
35420 4UD=(TENS-TPS)/(41*43*F9C*B)
35430 MUCI)=(TENS~TPS)*(DCI)~{2*{UD}+TPS*(DCI)*DP(L))
35440 ICR(I)=9*(U0**3/3-0+N*AS(I)*(O(I)-(HD)**?
35450+ +(N-1)+APS(1)+(4UD-DP(1))++2
35460 GITT 152
35470C
35480C: 4UD 4 D*
35490 140 FPS=-TER41+SORT(TER41**2-TER42)
355000: F'S MUST BE <= FDY
35510 IF(FPS-LT-FOY)(BT% 145
35520 FPS=F0Y
35530 145 TERM3=TENS+APS(I)*FPS
35540 (UD=TERM3/(K1*K3+FDC+B)
35550 MICL) #TERM3*(DCT)-(2*(ID)-APS(I)*FPE*(D(I)*DP(I))
35560 ICR(I)=9+4')D++3/3+V+A5(I)+(D(I)-4UD)++2+V+AP5(I)+(DP(I)-4UD)++2
35580C
35590C: WALL HAS NO COMPRESSION REINFORCEMENT
35600 150 KUD=TENS/(K1*K3*FUC*F)
35610 MU(I)=TENS*(K(I)=K2*KUD)
35620 ICR(I)=R*KID**3/3*0*N*AS(I)*(D(I)-KID)**2
35640 152 ICTaT=ICTaT+ICR(I)
35650 170 CONTINUE
35660C
35670C: DETERMINE AVERAGE CRACKED MOMENT OF INERTIA
35680 175 IC=ICT7T/11
35690 RETURN
35700 END
50000 SURROUTINE TRANS (B. ZL.V. ZLH. ICASE, KRAK, ZKLMSE, ZKLMFE, ZKLMP, VL1S,
          VL25. YS15. VS25. VL1F. VL2F. VS1F. VS2F. VL1P. VL2P. VS1P. VS2P)
50030C
50040C: THIS SUBROUTINE DETERMINES LOAD AND MASS TRANSFORMATION FACTORS
50050C: AND DYNAMIC REACTION COEFFICIENTS FOR TWO-WAY HALLS.
50060C
50070C: DETERMINE LEAD AND MASS TRANSFERMATION FACTORS
50080
50020
             B3=9+52
50100
             B4=82+82
50110
             85=92+B3
50120
             96=83+B3
50130C
50140C: CASES 1 4 5 -- ELASTIC RANGE
50150 330 ZK45E1=20.49+83+(1./12.-32/7.5+83/21+84/14-85/15+86/90)
             Z44SE2=U. 5038-0.7066+3
50160
50170
             ZKLSE1=6.4+B2+(1./6.-B2/10.+B3/30.)
50150
             ZKLSE2=0.64-0.8134+8
50190
             BARS1=8+(1-/12--82/15-+U3/42-)/(1-/6--82/10-+B3/30-)
             BARS2=(0-127073-0-184524*9)/(0-4-0-508333*8)
%445E=7445E1+7445E2
50200
50210
             ZKLSE=ZKLSE1+ZKLSE2
50220
50230
             IF( (RAC. EQ. 1) 03 T7 335
5024CC: CRACK PATTERN A
50250
             CVS=0.548
50260
             CVL=0.5*(1.9-5)
50270
             XP=7LH+8/3.0
             XBARS=BARS1+ZLH
50280
50270
             ZP=ZLV#(1.0-4.0+9/3.0)/(4.0+(1.0-B))
 50300
             ZBARS=BARS2+ZLV
50310
             XBARP=0.5+B+ZLH
50320
             ZBARP=ZLV+(1./24.-8/16.)/(1./5.-9/6.)
50330
              GET8 338
50340C: CRACK PATTERN B
50350 335 CVS=0.5*(1.0-8)
50360 CVL=0.5*B
             XP=7LH+(1.0-4.0+B/3.0)/(4.0+(1.0-B))
50370
```

STATE OF THE PARTY OF THE PARTY

Tobaco properties and the second of the seco

```
50350
            XHARS=BARS24 ZLH
50390
            7P=7LV=9/3.0
            29485=84451#2Lv
>0400
50410
            KBARP=7LH=(1./24.-B/16.)/(1./8.-9/6.)
50420
            ARRESO. SERETL J
            ZKLMSE=7KMSE/7KLSE
50439 338
50450
            @ F1(390, 340, 350, 360, 390, 340, 470), ICASE
50460C
50470C: CASES 2, 3, 4 4 -- 5LASTIC RANGE
50470 350 IF(KRAK+ED+1)3313 345
50490 9313 340
50500 360 [F(4944-27-0) 6)T1 365
50510C: CASES 2A, 29, 3A, 49, 4 6
50520 340 ZKMFE1#512.0*85*(1.0/30--9/10.5+3.*82/28.-93/18.+84/9U.)
50530
            7KLFE1=32.0+R3+(1./12.-9/10.+B2/30.)
50540
            BARF1=9*(.05-9/15.+92/ x2.)/(1./12.+8/10.+82/30.)
50550
            MT9(370, 365, 370, 370, 370, 365), I CASE
50560C: CASES 2A, 2B, 38, 44, 4 6
50570 365 744FE2=0.4065-0.6144eR
50590
            74LFE2=C.5344-0.7323+H
50590
            BARF2=(.091667-.138095+B)/(.266667-.366667+3)
50600
            GTT3 (375, 369, 375, 375, 375, 368), ICASE
50610C: CASES 2A 4 2B
50620 368 ZK4FE=ZK4FE1+ZK4F32
50630
            さくしたち=さくしをお1+さくしをお2
50640 63T3 330
50650C: CASES 34 $ 48
50660 370 ZAMFE=ZAMFE1+ZAMSE2
50670
            Z4LF5=Z4LF51+Z4LS62
50480
            G7 T3 330
50690C: CASES 3R, 4A, & 6
50700 375 744FF=2445E1+244FE2
            TKLFE=TKLSE1+TKLFE2
50710
50720 380 ZKLMFE=ZKMFE/ZKLFE
50740
            6913 390
50750C: CASE 7
50760 470 ZKLMFE=0.73
50770C
50780C: ALL CASES -- PLASTIC GANGE
50790 390 ZKMP={1+0-B)/3+0
            24LP=0.5-8/3.0
50800
50810
            スペレッドコスペットスペレド
509200
50830C
50840C: DETERMINE DYNAMIC REACTION COEFFICIENTS FOR SHORT (VS) AND
SOBSOC: LANG (VL) EDGES
508 60C
509 70
            IF(ICASE-LT-5)GT7 375
SORRO
            XBARS=1E-10$ BARF1=1E-10$ XBARP=1E-10
50990 395
            CONTINUE
            69 T7 ( 450, 400, 400, 420, 450, 400, 445), I CASE
50900
            IF(4RA4.50.1) 00T0 410
50910 400
50920
            XBARF=BARF1+7LH
50930
            IF(ICASE-50-3) G3T3 430
50940 405
            2944F=844F2+7LV
            GB F3 440
XBARF=BARF2*ZLH
50950
50960 416
            1F(1CASE-E0-3)@T3 435
509 70
50980 415
            ZBARF=BARF1 *ZLV
50990
            GB F3 440
            IF(484K-E2-1) 6813 425
51000 420
51010
            KBARF=PARSI+71.H
           GBT3 405
XBARF=BARS2+ZLH
21030
51030 425
           GOTA 415
ZBARF=BARS24ZLV
51040
51050 430
            GHTD 440
ZBARF=BARS1+7LV
51060
51070 435
51050 440
            CONTINUE
51090C
SILLOCE CASES 2. 3. 4. 4 6 -- ELASTIC RAYGE
51110
            VSIF=CVS+(1.0-YP/XBARF)
            US2F=CUS+(XP/XBARF)
51120
            VL1F=CVL+(1+0-2P/ZRARF)
VL2F=CVL+(2P/ZRARF)
51130
51140
```

They was the property of the same of the same of the same of

A CONTRACTOR OF THE PROPERTY O

The same of the sa

```
51170
            G3T9 450
51150C
51190C: CASE 7 -- ELASTIC RANGE
51200 445 VS1F=0
$1220
            VR. 1F=0 - 459
            V.2F=0-165
51250C
$12600: CASE 1 & 5 -- ELASTIC RANGE
51270 450 VSIS=CVS*(1.0-X/YXRARS)
            VS25=CUSe(XP/XHARS)
51280
            VL 1 S= CVL + (1.0-2P/28ARS)
51290
51300
            VL2S=CVL+(ZP/ZBARS)
51340C
51350C: ALL CASES -- PLASTIC RANGE
51360 460 VSIP=CVS+(1.0-XP/X949P)
51370
            VS2P=CVS*(XP/XPARP)
51380
            W. 19#CM.#(1.0-79/79ARP)
51390
            W_2P=CVL+(7P/794RP)
51400
            RETURN
51419
70000
            SUBRRUTINE RANDRA (TENTRY)
70010C THIS SUBRUTINE INPUTS MEAN AND STANDARD DEVIATIONS FOR RANDAM 70020C VARIABLES: GENERATES RANDAM VALUES: AND CONTROLS REDUIRED
       NIMBER OF CASES TO BE RUN: AND BUTPUTS FINAL RESULTS AND SUMMARY
70030C
70040C
70050 COMMON KINC.LDTYPE, KRF, KRAND, TIME, I, Y(30), 2, QU, YU, YFAIL,
70052+
         ELS, ELL, HS, PV, FPC, FDY, I CASE, NJBAR, AS(4), APS(4), D(4), DP(4), FDC,
70054+
         EC. ES. R. ALP. ALP2. AREA. 24ASS. VFAIL. C(LM. VL1. VL2. VS1. VS2.
70055+
         MEMB, ASCL. ASCS, VCL. VCS. ASS, ASS, AF, BF, CF, 1x,
70056+
         W. Pa. Ca. Lac. S. ZLEV. CD. PSO. PDO. PR. PEXT. PC. TC. TO. DELAY.
70055+
         NWI N. RHOO. V3. L 1. AA(8.2). NY(8). AFRONT. ASI DE. G. 62. 63. G4. PP2. DT
           COMMON /RAND/ TIMEC
70080
70090
            DIMENSIAN CHI25(7), CH1975(7), TDIST(7)
70100C
70110C VALUES FOR 97-5% (F=19-24-29-34-39-44-49)
70120
            DATA CHI25/.4688..5167..5533..5825..6065..6267..6440/
70130
            DATA CHI975/1-7295,1-6402,1-5766,1-5284,1-4903,1-4591,1-4331/
70140
            DATA TDIST/2.093,2.064,2.045,2.032,2.022,2.016,2.010/
70150C
70160
             00 TO ( 5, 50, 70 ), I ENTRY
70170
          5 XDUMMY=XN3RM1(-1.0,0.0,1.0)
70180C INITIALIZE RANDON NUMBER GENERATUR
70190
            PRINT . / . + INP'IT VRAND . .
70200
            READ, WRAND
70210
            03 47 I=1. VRAND
            XDUMMY=XNORM1 (0.0, 0.0, 1.0)
70220
70230
         47 CONTINUE
            INDEX=0$ SPS3=0$ SSPS3=0
70240
7025u
            I CHECK= 20
70260C
70270C
        INPUT MEAN AND STANDARD DEVIATION FOR RANDON VARIABLES
70275
            IF(L2C-E9-2) 09T0 30
70250
            PRINT B7
70290
            READ, SHEAN, SSD
70410C
       REINFORCED CONCRETE WALLS
70420 30
           PRINT 86
70430
            READ, FDYMEAN, FDYSD
70440
            IF(LOC.EQ. 1)PRINT 96
            IFCLOC. NE. I PRINT 95
70445
70450
            RETURN
70460C
70 470C
        GENERATE RANDOM VALUES
70570
       SO FDY=XN3RM1(0.0, FDYMEAN, FDYSD)
            IF(FDY-LE-0) GOTO 50
70580
70585
            IF(Lac.Eg. 2. AR. SMEAN. Eg. O) GATA 65
            S=XN8RM1 (0.0, S4FAN, 550)
70590
       60
70600
            IF(S.LE.O) ONTO 60
70610
       65
            INDEX=INDEX+1
70620
            RETURN
70630C SIM VALUES OF PS9 AND PS0++2 FOR USE IN STATISTICAL ANALYSIS
            SPS##$P$#+P$#
70640
70650
            SS250 * SSPS0 * PS0 * PS0
70660C
70670C SUTPUT FINAL RESULTS
70730
            IF(LaC.E9.1)PRINT 92, FDY, S.PSO, TIMEC
70735
            IF(LOC. NE. 1) PRINT 90, FDY, PSO, TIMEC
```

PROGRAM RCSLAB (CONCLUDED)

THE RESIDENCE OF THE PROPERTY OF THE PARTY O

```
70740 BO IFCINDEX-LT-ICHECK) RETURN
70750C
70760C DETERMINE MEAN, STANDARD DEVIATION, AND STANDARD ERROR FIRE PSA
70770
             7 N3=1 NDEK
70 79 0
             *4E44=5P$ 1/743
70 79 0
             SU=SORT((SSPS)-7NJ+7MEAN+7MEAN)/7N9)
70900
             STOFRR=SD/(SORT((N3-1))
TORIOC CHECK IF MAXIMIM OF SO PSD SAMPLES DEVALVED
70920
            IF(INDEX+E0+50) G1 F1 62
70830C CHECK IF 45% CONFIDENCE INTERVAL FOR MEAN PSO VALUE IS
             1FCSTDE9R*TD1STCCLVDEX-15)/S)/74EAV-0T-0-10) G3T3 61
79949
70950C
70960C CONFIDENCE INTERVAL IS ALTHIN 102 -- DETERMINE UPPER LIMIT DE
70870C 954 CINFIDENCE INTERVAL FOR STANDARD DEVIATION
TORROC PRARABILITY VALUE AND ITE 95% CONFIDENCE INTERVAL UPPER LIMIT 70890 68 SDU=SD/(SDRT(CH125((INDEX-15)/5)))
70900C CHECK IF MAXIMUM JF 50 PSJ SAMPLES BRIGINED
70910 TF(INDEX-EQ-50) G3T3 53
70920 CHECK IF UPPER VALUE 3F 95% CONFIDENCE INTERVAL FOR STANDARD
70930C DEVIATION IS WITHIN 0-10*MEAN OF THE STANDARD DEVIATION
70940 IF(((SDU-SD)/ZMEAN)-GT-0-10) G3T3 61
70950C
709 600 954 CONFIDENCE INTERVAL IS WITHIN 103 FOR MOTH MEAN AND MOT 709 700 PROBABILITY VALUE -- THEREFORE SUFFICIENT SAMPLES MATAINED
TOPROC DETERMINE 95% CONFIDENCE INTERVALS FOR MEAN, STANDARD DEVIATION
71000C AVD 10% AND 90% PRIBABILITY VALUES
71010
         53 THEAVE # THEAN-STOERR + TOT ST((TYDEX-15)/5)
71020
            ZMEANUEZMEAN+ STDERR+TDISTCCLUDEX-15)/5)
71 230
            59L=59/(59RF(CHI975((INDEX-15)/5)))
71040
             P17=7454V-1.282450
71050
            P10L= (464V-1 - 242+ 90)
71060
            P10U= 24544-1 - 292+5'&
71070
            P70=7454V+1.242+5D
71030
            990L=34544+1.282+SDL
71090
            P90=74F44+1.242+5D
            P70-1=74EAN+1-2824504
71100
71110
            P9011=74EAN+1-282#S0 J
71120C
71130C 34TPUT STATISTICAL PARAMETERS OF INCIPIENT COLLAPSE PRESSURE
71140
            PRINT 100-ZMEAN, ZMEANL, ZMEANH, 50, SUL, 50-1, P10-P10L, P101,
71150+
              P90. P30L. P90U
71150
            PRINT 105, INDEX, STOERR
71170
            CIFT GOO
71190C
71190C 958 CONFIDENCE INTERVAL IS NOT WITHIN 198 FOR MOTH MEAN AND 90
7:2003
TIRING VALUES -- THEREFIRE BRIAIN 5 ADDITIONAL SAMPLES
71220
         61 ICHECK=ICHECK+5
71230
            RETURN
71240C
71270 86 FARMST(/*INPUT MEAN AND STANDARD DEVIATION FOR FDf***) 71280 87 FARMAT(/*INPUT MEAN AND ATTACHMENT DEVIATION FOR S***)
71290
        90 F3R4AT(F9.1.F10.2.F14.3)
71310
       92 F3R4AT(F9.1,F11.2,F10.2,F14.3)
       95 FORMAT(///, SX. *FDY* 74. *PS3*. 6x. *C3LLAPSE TIME*)
71340
71350
       71360
       100 FARMATI///. IIX. *STATISTICAL PRIPERTIES OF INCIPIENT ! 14.
              //.39x, 4958 CANFIDENCE LIMITS*, /. 7x, *ITEM*, 19x,
71370+
71330+
               * VAL IE
                                           UPPER+,//. 4 MEAN*, F29. 2.
                             LINER
               2F12.2.//. STANDARD DEVIATION . F15.2.2F12.2.//.
71390+
              * 101 PR3849ILITY VALUE*, 3F12.2, //.
* 901 PR3849ILITY VALUE*, 3F12.2)
71 400+
71410+
71420 105 FORMATC//, SX, ON MBER OF OBSERVATIONS +.13, /, SY,
71430+
               *STANDARD ERROR #*.F5.2)
71 440C
71450
       999 STOPS END
71460 FUNCTION XNORMICX.A.P)
71470 IF(X)10, 20, 20
71480 10 X0=RANF(-1.0)
71490 20 X1=RANF(0.0)
7150 x2=RANF(0.0)
71510 Y=50RT(-2-0+AL3G(X1))+(U .(6-243144+X2))
71520 XN3R41=4+Y+9
71530 RETURN
71540 END
```

RESTRAN

Restrained Reinforced Concrete Slab

PROGRAM RESTRAN

The state of the s

```
01000 PROGRAM RES (INPUT, OUTPUT)
010100
         THIS PROGRAM CALCULATES THE RESISTANCE OF A REINFORCED CONCRETE
C1980C
         SLAB RESTRAINED AGAINST LATERAL MOVEMENT AT THE EDGES
G1030C
01050 COMMGN KING,LDTYPE,KRF,KRAND,TIME.I,Y(100),Q,QU,YU,YFAIL,FDC,
01052+ ZLS,HS,FDY,AREA,ZMASS,ZKLM,VS1,VS2,PS0,PD0,PF,PEXT,PC,TC,TO,
G1054+ PO,DELAY,5,FPC,FY
0106G DIMENSION A(80), V(80), T(80), VS(80), QQ(80), PN(80)
01060 COMMON /RAND/ TIMEC
01100C
01104C PRINT FROGRAM TITLE, DATE, AND TIME 01105 5 DA=DATER(IDATE) $ CL=CLOCK(ICLOCK)
01106 PRINT 603, IDATE, ICLOCK
01107 603 FORMAT(////*PROGRAM RESTRAN (REVISED 12/22/73)*,5X,A9,5X,A9)
011080
01110C * READ TITLE AND COUTROL PARAMETERS *
01120 PRINT 67
01100 READ 68, TITLE
01140 PRINT 85
01150 READ.KINC.LDTYPE.KRF.KRAND
01155C
01160 DELAY=0
01180 CALL RESIST(1)
01180 IF(KHAND+NE+1)CALL RESIST(2)
01185 IF(LDTYPE+EQ+0)GCTO 50
01190 CALL FORCE(1)
01200 IF(KPF-E2-0)GOTO 14
01210 CALL FILL(PINT.1)
01260 14 IF(KRAND.NE-1)GOTO 13
01270 CALL FORCE(4)
01280 CALL RANDOM(1)
01890 34 CALL RA (DOM(2)
01300 35 CALL RLSIST(2)
013100
01380C: MINIMUM, MAXIMUM, AND STARTING VALUES ARE DETERMINED FOR CASES
01330C: WHERE THE LOAD CAUSING INCIPIENT COLLAPSE IS TO BE FOUND 01340 13 IF(KINC+EQ+0)GOTG 23
01350
              PF-QU
01360
              PFMAX=0
01370
              PFMIN=PF/2-0
01360
             6616 50
01390 16
              PF=(PFMIN+PFMAX)/2.0
01400 20
             CALL FORCE(2)
01410 23
             IF (KRF-E9-0)GOTO 84
01420
             CALL FILL(PINT, 2)
01430C
Q1440C1
          INITIALIZE VALUES FOR BETA METHOD (BETA=1/6) AND COMPUTE VALUES
Q1450C1
          FOR FIRST TIME INTERVAL ASSIMING ELEMENT INITIALLY AT REST
01460 24
01470
              1-1
              TIME-0
01460
             V(1)=0 $ Y(1)=0
01490
              DELTA-0-001
31500
             IFCKRF.NE.13GOTC 30
01510 27
             IF(TIME-GE-!DELAY-.00001))8010 30
01520
             TIME-TIME+DELTA
01530
01540
            CALL FILL(PINT,3)
GOTO 87
01649 30 CALL RESIST(3)
01650 A(1)=0.0 % VS(1)=0.0
01660
             T(1)=TIME
01650C
01690C: PROCEDURE FOR ALL SUBSEQUENT TIME INTERVALS
01720 1
              1=1+1
             IF(1-LT-81)0070 11
01710
01720
             PRINT OF TIME
01730 98 FORMAT(/+3=81)
                             TIME -+.F6-3.+: FAILURE ASSUMED TO NOT OCCUR+>
G1740
             GOTO 6
01730 11
             ATLIBC+SMIT=SMIT
01760
              T(i)=TIME
01770
              A(1)#A(1-1)
             IF (KKF.NE.0)6010 10
01775
01780
             CALL FORCE(3)
             PH(1)=PEXT
01790
01800
             S OTOB
```

The state of the s

```
01880 10
            CALL FILL(PIN1,3)
01890
            PN(I)*PINT
01910 2
            CONTINUE
01920
            DO 8 JJ=1.10
             Y(1)=Y(1-1)+DELTA=V(1-1)+DELTA+DELTA+(A(1-1)/3.+A(1)/6.)
01930
01940 CALI RESIST(3)
01960 4
            ANEW-AREA+(FN(I)-Q)/(ZMACS+ZFLM)
             ADELTA-ANEW-A(1)
01980
             A(I)=ANEW
01985 IF(ANEW-EQ-C)PRINT, +1985+, TIME, PN(1), Q, ZMASS, ZKLM, Y(1), A(1-1)
01990
             IF(ABS(ADELTA/(ANEW+1E-10))+1.T+C+01)GOTO 9
02000 8
             CONTINUE
             A(1)=ANEW-ADELTA/2.0
02010
02020 PRINT 80, TIME, PF, A(1), Y(1)
02030 9
             CONTINUE
02040
             Y(I)=Y(I-1)+DELTA+V(I-1)+DEL1A+DELTA+(A(I-1)/3.+A(I)/6.)
02050
             V(I)=V(I-1)+DELTA+(A(I)+A(I-1))/2.0
02060
            VS(1)=4.0+AREA+(VS1+PN(1)+VS2+Q)
02070
            0=(1)00
02090C
02100C: CHECK FOR MAXIMUM DEFLECTION OR FAILURE
           IF MAXIMUM DEFLECTION REACHED, WALL DID NOT FAIL
021100#
            IF(Y(I)-LE-Y(I-1)-AND-PN(I)-LE-PN(I-1))GOTO 6
02130
            IF(Y(1).LT.0)G010 6
02135
            IF(Y(1).GE.YFAIL)GOTO 7
02140
            IF(TIME-DELAY-GE-0-010)DELTA=0-002
02160
            IF(TIME-DELAY-GE-0-020)DELTA=0-005
02170
            1F(TIME-DELAY.GE.O.100)DELT4=0.010
02180
            IF(TIME-DELAY.GE.O.500)DELTA=0.050
02190C:
           IF FAILURE DEFLECTION REACHED, ELEMENT FAILED
             GOTO 1
05550C
02230C: INTERVAL HALVING PROCEDURE TO DETERMINE LOAD CAUSING INCIPIEMT
02240C: COLLAPSE FOR CASES WHERE DESIRED
02250C:
           ELEMENT DID NOT FAIL -- SET PFMIN TO PF
02860 6
            CONTINUE
02250
            IF(KINC-EQ-0)GOTO 18
02290 36
            PFMIN-PF
02300 IF(PFMAX-GT-0)GOTO 16
02310
             PF=2.0*PF
08360
             03 OTO
02330C:
           ELEMENT FAILED -- SET PFMAX TO PF
02340 7
            CONTINUE
02350
            TIMEC-TIME
02370
            IF(KINC-EQ-0)GOTO 18
02360 37
            PFMAX=PF
           CHECK TO SEE IF LOAD RANGE IS WITHIN DESIRED ACCURACY
02400 17
             IFCCPFMAX-PFMIN>/PFMIN+GT+0+01)GOTO 16
02410
            IF(KRAND.NE.1)GOTO 18
09490
            CALL RANDOM(3)
02430
            GOTO 3A
02440C
02450C: OUTPUT DATA INCLUDES THE MAXIMUM DEFLECTION AND TIME OF 02460C: OCCURANCE FOR A NON-FAILING ELEMENT OR THE TIME AND VELOCITY 02470C: AT COLLAPSE FOR A FAILING ELEMENT. OPTIONAL OUTPUT IS THE
OR480C: ENTIRE BEHAVIOR TIME-HISTORY.
08490C
02509C: OUTPUT LOAD DATA
02510 16
             CALL FORCE(4)
025201
02530C: OUTPUT FINAL RESULTS
08540 IF(Y(I)-LT-YFAIL)PRINT 70.Y(I).T(I)
02550 IF(Y(I)-GE-YFAIL)PRINT 71.T(I).V(I)
G2570 GOTO 42
02577C
02578C CHECK TO SEE IF ENTIRE TIME-HISTORY IS DESIRED
02580 42 PRINT 72
02590 READ, IPRINT
02600 IF(IPRINT-EQ-0)GOTO 25
02680 PRINT 76,(T(J)-PN(J),A(J),V(J),Y(J),QQ(J),US(J),J=1,I)
09690 25 PRINT 77
02700 0070 5
1/100
1/20 67 FORMATC//OINPUT TITLEO,+>
```

A CONTRACTOR OF STRUCK PROPERTY OF STRUCK ST

AND SOLVED THE SEASON AND SOLVED SOUTH SOLVED SOLVED THE SOLVED S

こうかんできることがあるとのできることがあることがあるという

```
02740 70 FORMAT // NO FAILURE - MAX DEFLECTION OF+, F6.2,
                                                 . IN. REACHED AT+F7.3, * SEC+)
                                     02760 71 FORMAT(/>FAILURE OCCURRED AT+, F7.3, + SEC (FINAL VELOCITY ++,
                                     02850+ (F6-3,F9-3,F12-1,F12-2,F12-4,F10-2,F9-0))
02850 77 FORMAT(///-7/-------
                                      02870 80 FORMAT(/*ACCELERATION NOT CONVERGING AT TIME =*,F6.3,
                                                        * SEC (PF **, F7.3, * PS1)*/*
                                                                                            A(I) SET EQUAL TO+.
                                                        F6-1.+ (AVG OF LAST 2 ITERATIONS)+/+
F6-4.# (N.4)
                                                                                                       Y(1) =+,
                                      08910 85 FORMAT(/*INPUT KIMC.LDTYPE.KRF.KRAND(1=RANDOM)*,+)
                                      03000C OUTPUT RESISTANCE FUNCTION (LDTYPE=0)
                                      0J030 52 READ, YSTART, YEND, YINC
                                      03200 60 FORMAT(//+IF INTERMEDIATE VALUES OF RESISTANCE FUNCTION ARE +.
                                                *TO EE PRINTED, */*INPUT STARTING, ENDING, AND INCREMENTAL *, *DEFLECTION VALUES*/*(IF NO INTERMEDIATE VALUES ARE *
                                                *TO BE PRINTED. INPUT ZEROS)+)
                                     03840 61 FORMAT(/*PTORE VALUES*,*)
03250 68 FORMAT(/*DEFLECTION (IN-)*,5X,*RESISTANCE (PSI)*)
03860 63 FORMAT(F11-4,F21-2)
                                      10000 SUBROUTINE FORCE(IENTRY)
                                               THIS SUBROUTINE INPUTS THE LOAD PARAMETERS AND DETERMINES
                                               THE LOAD AT A GIVEN TIME FOR THE FOLLOWING LOAD TYPES:
                                                  1. IDEALIZED BLAST LOAD (FRONT OR SIDE FACE)
                                      10050 COMMON KINC,LDTYPE, KRF, KRAND, TIME, 1, Y(100), Q, QU, YU, YFAIL, FDC, 10052+ ZLS, MS, FDY, AREA, ZMASS, ZKLP, VS1, VS2, PS0, PD0, PR, P, PC, TC, TO, 100561 P0, DELAY, S, FPC, FY
                                      10150 GOTO(100,200,300,4), IENTRY
                                      10170C + INPUT LOAD PARAMETERS +
                                      10180C: LOCATION 1. FRONT FACE LOADING (USED IN ROOM-FILLING PROCEDURE)
10190 100 W=1000.0 $ P0=14.7 $ C0=1180.0
                                      10250 GOTO 105
10260C: LOCATION 2. TOP FACE LOADING
                                      10890 PR-2-0-PS0-(7-0-P0-4-0-P50)/(7-0-P0-P50)
                                      11010C CALCULATE LOAD PROPERTIES FOR GIVEN PEAK PRESSURE
```

Between the way to be a series of the series

publication of the second seco

experience and the second of t

```
11040 205 PS0=(PR-14-0+P0+SQRT(196-0+P0+P0+196-0+P0+PR+PR+PR))/16-0
11050 GOTO 215
11060 210 PSO-PR
11070 215 PD0=2.5+PS0+PS0/(7.0+P0+PS0)
11080 U=C0+SQRT(1.0+(6.0+PS0)/(7.0+P0))
11090 T0=W++0.3333/(2.2399+0.1885+P50)
11100 GOTO(220,825).LOC
11110 220 TC=3.0+S/U
11120 PC=PSO+(1-TC/TO)+EXP(-TC/TO)+PDO+(1-TC, 10)++2+EXP(-2+TC/TO)
11130 CD=1.0
11140 RETURN
11150 225 TA=ZLEN/U
11160 TA2=TA/2.0
11170 TA2TO=TA2/TO
11180 PA-PSO+(1-TA2TO)+EXP(-TA2TO)+CD+PDO+(1-TA2TO)++2+EXP(-2+TA2TO)
11190 RETURN
15000C
12010C CALCULATE LOAD
12030 300 GOTO(305,310),LOC
12040 305 TTO=TIME/TO
12050 IF(TIME-GT-TC)GOTO 320
12CSO P=PC+(TC-TIME)+(PR-PC)/TC
12070 RETURN
12050 310 TTO=(TIME-TAP)/TO
12090 IF(TIME-GT-TA)GOTO 320
12100 P=PA+TIME/TA
12110 RETURN
12120 320 IF(TTO-GE-1-0)GOTO 330
12130 P=PSG+(1-TTO)+EXP(-TTO)+CD+PDO+(1-TTO)++8+EXP(-2+TTO)
12150 RETURN
12160 330 P=0
12170 RETURN
13000C
13010C PRINT LOAD DATA
13080 4 IF(KINC-EQ-0)80TO 400
13030 PRINT 640.LDTYPE
13040 GOTO 410
13050 400 PRINT 645, LDTYPE
13060 410 CONTINUE
13070 415 GOTO(420,425),LOC
13080 420 PRINT 650
13090 GOTO 430
13100 425 PRINT 655
13110 430 PRINT 660, V, PO, CO
13180 IF(KRAND-NE-O)RETURN
13130 BOTO(435,440),LOC
13140 435 PRINT 665,5,TC,PR
13150 GOTO 445
13160 440 PRINT 670, ZLEN, TA, PA
13170 445 PRINT 675, U, TO, CD, PSO, PDO
13160 RETURN
13500C
13510C LOAD TYPE 5 -- ARBITRARY LOAD SHAPE
13580 500 GOTO(510,520,530,540), IENTRY
13530C
13540C INPUT LOAD DATA
13550 SIO PRINT 68C
13560 READ,NPOINT,(TT(J),PP(J),J=1,NPOINT)
13570 FACTOR=1.0
13580 IF(KINC-EQ-0)GOTO 518
13590 PMAX-PP(1)
13600 DO 515 J=R+NUOINT
13610 S15 IF(PP(J)+GT-PMAX)PMAX=PP(J)
13680 S16 PX=PP(2)-PP(1)
13630 TX=TT(R)-TT(1)
13540 JJ=1
13650 RETURN
13660C
13670C CALCULATE MAXIMUM LOAD
13580 520 FACTOR-PR/PHAX
13690 GOTO 518
13700 RETURN
137100
13780C CALCULATE LUAD
```

"我们在我们我们的一个大学的,我们就是我们的人,我们就是我们的人,我们就是我们的人,我们就是我们的人,我们就是我们的人,我们就是这个人,我们也不是什么。""…………………………………………………………………………………… "我们在我们我们的一个大学的,我们就是我们的人,我们就是我们的人,我们就是我们的人,我们就是我们的人,我们就是我们的人,我们就是我们的人,我们就是我们的人,我

The content of the co

```
13730 530 IF(TIME+LE+TT(JJ+1>)G0T0 535
13740 JJ=JJ+1
13750 PX=PP(JJ+1)-PP(JJ)
13760 TX=TT(JJ+1)-TT(JJ)
13765 IF(TX+EQ+0)TX=1E-10
13770 GOTO 530
13780 535 P#FACTOR*(PP(JJ)*(TIME-TT(JJ))*PX/TX)
13790 RETURN
13800C
        PRINT LOAD DATA
13810C
13815 540 IF(KINC-EQ-1)PRINT 640,LDTYPE
13820 IF(KINC-EQ-0)PRINT 645,LDTYPE
13825 PRINT 690
13830 DO 545 J=1.NPOINT
13840 P=FACTOR+PP(J)
13850 545 PRINT 695,TT(J),P
13860 RETURN
14000C
14010 600 FORMAT(//#INPUT S+,+)
14020 510 FORMAT(/#INPUT PSO+,1)
14070 640 FORMATC/+LOAD CAUSING INCIPIENT FAILURE IS AS FOLLOWS: +.
14071+ /-SX,*LOAD TYPE NUMBER*.12)
14080 645 FORMAT(/*PROPERTIES OF LOAD ACTING ON WALL ARE AS FOLLOWS:*.
14081+ /-SX.+LOAD TYPE NUMBER+-12)
14090 650 FORMAT(SX.+(FRONT FACE)+)
14100 655 FORMAT(5X, +(SIDE OR TOP FACE)+)
14110 660 FORMAT(10X,+V =+,F8-1,+ KT PO =+,F6-2,+ PSI
14111+
            F7.1,* FPS*)
14120 665 FORMATCIOX, +S -+, F6 - 1, + FT
                                                  TC =+,F6.3, * SEC
                                                                             PR ...
14121+ F7.3, P51+)
14130 670 FORHAT(10X, L =+, F6.1, + FT
                                                   TA = *. F6.3. * SEC
            F7.3,* PSI+)
14131+
14140 675 FORMAT(10X,*U =*,F7.1,* FPS TO =*,F6.3,* SEC
14141* F5.1,/,8X,*PSO =*,F7.3,* PSI PDO =*,F7.3,* PSI*)
                                                                            CD ...
14150 680 FOSMAT(//ulletInput number of load points and the time and ullet
14151+
            *FRESSURE AT EACH POINT*)
14160 690 FORMAT(/10X,+TIME
14170 695 FORMAT(F15-3,F12-2)
15000 END
                                         PRESSURE
20000 SUBROUTINE FILL(P3, IENTRY)
20010 RETURN
80020 END
30000 SUBROUTINE RESIST (IENTRY)
30010C THIS SUBROUTINE DETERMINES THE RESISTANCE FUNCTION, 30020C TRANSFORMATION FACTORRS, AND REACTION COEFFICIENTS
         FOR A LONGITUDINALLY RESTRAINED REINFORCED CONCRETE SLAB
30036C
30040C
30050 COMMON KING,LDTYPE,KRF,KRAND,TIME,I,Y(100),Q,QU,YU,YFAIL,FDC,
30032 ZLS-HS, FDY, AREA, ZMASS, ZKLM, VSI, VSZ, PSO, PDO, PR, PEXT, PC, TC, TO, 30054 PO, DELAY, S, FPC, FY
30080 COMMON /MOM/ AS(4),D(4),APS(4),DP(4),MU(4),R(4),
30085+ K1. K2. K3. EPSC. ES. FPS. KUD. E(4)
30090 REAL MU.KI.K9.K3.KU.N.NUXO.NUXOLNUXAVG.NUZO.NUZUSR.NUZAVG
30095 REAL MUIBAR.MU2BAR.MU3BAR.MU4BAR.MUI.MUJ.NB.KT
30100C
30110 GOTO (1,2,3), IENTRY
30120C
30130C ENTRY 1. INPUT AND ECHO SLAB AND REINFORCEMENT PROPERTIES 30150 1 PRINT 600
30160 READ, ZLS, ZLL, HS, FPC, FY, DIF
30165 PRINT 670
30170 DO 100 1=1,4
30180 PRINT 610.1
30190 P(I)=0.0
30200 READ.AS(1).D(1).APS(1).DP(1)
30840C SLAB ASSUMED TO BE RESTRAINED AT CENTERLINE OF CROSS SECTION 30850 E(1)=0.0 30860 100 CONTINUE
30262 PRINT 711
30935 READ.ASCZ.ASCX
30266 ASCZ-ASCZ/12.0 $ ASCX-ASCX/12.0
30270 PRINT 602
30280 READ, $7. SX
30281C
```

The second second

er ment franklig in en bligger formen programme grant generally generally grant grant grant grant grant grant g

```
30282C CALCULATE VARIOUS CONSTANTS
30283 DIF-1-0+DIF/100-0
30265 FDC=DIF+FPC $ FDY=DIF+FY
30300 ALP=ZLS/ZLL
30310 ALP2=ALP+ALP
30315 ES=29E6
30318 AREA=ZLS+ZLL
30319 ZHASS=150+0+AREA+HS/(386+07+1728+0)
30320C
30321C
       OUTPUT SLAB PROPERTIES
30322 PRINT 620, ZLS, ZLL, HS, FDC, FDY
30323 PRINT 630
30324 DO 104 I=1,4
30325 IF(AS(I).EQ.0)GOTO 104
30326 P-AS(1)/(12.0+D(1)) $ PP-APS(1)/(12.0+D(1))
30327 PRINT 640,1,AS(1),P.D(1),APS(1),PP,DP(1)
30328C CHANGE UNITS OF REINFORCEMENT FROM SQ.IN./FT TO SQ.IN./IN.
30329 AS(1)=AS(1)/12-0 $ APS(1)=APS(1)/12-0
30330 104 CONTINUE
30332 RETURN
30340C
30350C ENTRY 2. DETERMINE PROPERTIES DEPENDENT UPON FDY AND FDC
30360 2 EC-57619.03+SQRT(FPC)
30370 N=ES/EC
30360 FDC=DIF+FPC $ FDY=DIF+FY
30390 K1=0.94-FDC/26E3
30400 K2=0.50-FDC/6E4
30410 K3=(3900.0+0.35*FDC)/(3E3+0.68*FDC-FDC*FDC/26E3)
30420 EPSC=0.004-FDC/65E6
30430 DO 110 I=1.4
30440 110 CALL MOMENT (0.0.1/FDY.FDC.HS)
30450 IF(MU(1)+GT+0+0)GOTO 120
30A60 QUITERMODAO
30470 B=0.5*(SQRT(3.0*ALP2+ALP2**2)-ALP2)
30480 GOTO 108
30490 120 GMU-MU(2)/MU(1)
30500C
30510C: DETERMINE POSITION OF YIELD LINES AND ULTIMATE RESISTANCE
30520C: COEFFICIENTS FOR TWO-WAY WALLS
30530 ZII=MU(4)/MU(2)
30540 Z139MU(3)/MU(1)
30550 GAMMA12=2-0+SQRT(1-0+ZI1)
3/560 GAPMA34=2.0+SQRT(1.0+ZI3)
30570 GRAT-GAMMA12/GAMMA34
30580 B=SQRT(1+Z11)+(GMU+ALP2/GAMMA34)+(SQRT(GRAT++2+3/
30590+ (GMU*ALP2))-GRAT)
30600C: IF BETA IS GREATER THAN 0.5 ASSUMPTION OF CRACK PATTERN A
30610C: NOT VALID AND CRACK PATTERN B IS ASSUMED TO OCCUR
30620 IF(8-LE-0-5)GOTO 105
30630C
30640C: CRACK PATTERN B
30650 KRAK-1
30660 B=SQRT(1.0+Z13)+(SQRT(1.0/GRAT++2+GMU+ALP2+3.0)-1.0/GRAT)
30670+ /(GMU+ALP2+GAMMA12)
30680 QUTERM=6+0+GAMMA12++2+ALP+GHU/(SQRT(3+1/(GHU+ALP2+GRAT++2))
        -1.0/(SQRT(GHU)+ALP+GRAT))++2
30690+
30695 IF(REAND+NE+1)PRINT 623
30696 623 FORMAT(/+CRACK PATTERN B -- RESULTS NOT FULLY CHECKED OUT+)
30700 GOTO 108
30710C
30720C: CRACK PATTERN A
30730 105 CONTINUE
30740 KRAK+0
30750 QUTERM=6.0.0GAMMA34002/(ALP+(SQRT(3+GMU+ALP2+GRAT++2)
30760+
         -ALP+GRAT+SQRT(GMU))++2)
30765C
30770C
        SECONDARY RESISTANCE
30780 108 Q5=QUTERM+MU(1)/(ZLS+ZLL)
30785C
        DETERMINE TRANSFORMATION FACTORS AND DYNAMIC REACTION COEFFICIENS
30790C
30795C TRANSFORMATION FACTORS AND DYNAMIC REACTION COEFFICIENTS 30798 CALL TRANS (8, ZLS, ZLL, KRAK, ZKLMP, VI. 1P, VL2P, VS1P, VS2P)
30800 DO 200 I-1.4
308' R(1)=(AS(1)-APS(1))+FDY/(K3+FDC)
```

The state of the s

Management of the control of the con

```
30820 200 CONTINUE
30830C SET ELASTIC STRAIN TO ZERO
30840 EAX=0.0 $ EAZ=0 )
30850 SXP=SX+EAX $ SZP=SZ+EAZ
30852C
30853C CALCULATE DEFLECTION AT ULTIMATE RESISTANCE
30855 IYU=1
30858C Z-DIRECTION STRIPS
30860 TERM1=HS+(R(3)-R(1))/K1
50670 TERM2=0.50ZLS0ZLS0(EPSC+(1.0+SZ)+SZP)
30672 GOTO 206
        X-DIRECTION STRIPS
30873C
30874 202 IYU-2
30880 TERM1=HS+(R(4)-R(2))/K)
30890 1ERM2=8+27.1+2LL+(EPSC+(2+0+B+SX-2+0+B+EAX+EAX)+SXP)
30900 206 1F(TERM2+8T-TERM1+TERM1)G0T0 210
30910 YU-TERMI-SURT(TERMI++2-TERM2)
30980 IF(YU-LT-0-42+HS)GOTO 235
30925C
        EMPIRICAL UPPER BOUND OF 0.42 TIMES SLAB THICKNESS FOR YU
30930 810 YU-0-42+HS
30935 235 CONTINUE
30937C
30938C
        CALCULATE IN-PLANE COMPRESSIVE FORCES
30940 NUZO=0.5*K3*FDC*((H5-0.25*SZP*ZLS*ZLS/YU)*K1-R(1)-R(3))
30950 IF(NUZO+LT+0)NUZO=0
30960 IF(NUZO-EQ-0-AND-IYU-EQ-1)GOTO 202
30970 NUZI.S2=NUZO-0+25+K3+FDC+K1+YU
30980 IF(NUZLSR-LT-0)NUZLS2=0
30990 NUZAVG-7-5+(NUZO+NUZLS2)
31030 NUXO=0-5+K3+FDC+((HS-0-5+B+SXP+ZLL+ZLL/YU)+K1-R(2)-R(4))
31040 IF(NUXO-LT-0)NUXO=0
31050 NUXBLL=NUXO-0-25+K3+FDC+K1+YU
31060 IF(NUXBLL-LT-0)NUXBLL=0
31110 HUXAVG=0.5+(NUXO+NUXBLL)
311150
31120C CALCULATE ULTIMATE COMPRESSIVE MEMBRANE RESISTANCE 31130 CALL MOMENT (KUXAVG,2,FDY,FDC,HS)
31140 MUSBAR-MU(2)
31150 CALL MOMENT (MUXAVG, 4, FDY, FDC, HS)
31160 MU4BAR-MU(4)
31170 CALL MOMENT (NUZAVG, 1, FDY, FDC, HS)
31180 MU1BAR=MU(1)
31190 CALL MOMENT (NUZAVG,3,FDY,FDC,HS)
31200 MU3BAR=MU(3)
31210 CALL HOMENT (NUZLS2,1,FDY,FDC,HS)
31220 MU1-MU(1)
31230 CALL MOMENT (NUZO, 3, FDY, FDC, HS)
31240 MU3=MU(3)
31850 QU=12-0/(ZLS+ZLS+(3-0-2-0+B))+(((ZLS/ZLL)++2/B)+(MURBAR
31260+ +MU4BAR-YU+(2-0+NUXBLL+NUXO)/6-0)+4-0+B+(MU1BAR-MU3BAR
31270+ -YU+(2-0+NUZLS2+NUZO)/6-0)+2-0+(1-0-2-0+B)+(MU1+MU3-YU+NUZLS2))
31430C
31500C TENSILE MEMBRANE BEHAVIOR
31510 TZ-ASCZ-FDY
31520 TX-ASCX+FDY
31525 IF(TZ-EQ-0-OR-TX-EQ-0)GOTO 312
31530 C1=3-14159+SQR (TZ/TX)+ZLL/(2-0+ZLS)
31540 KT=0
31550 DO 310 JJ-1,13,1
31560 JJE=JJ+8
31570 COSHJJ=0.5*(EXP(JJ*C1)*EXP(-JJ*C1))
31580 COSHJUR=0.5*(EXP(JUR+C1)+EXP(-JUR+C1))
31590 C2=(1.0-1.0/COSHJJ)/JJ++3-(1.0-1.0/COSHJJ2)/JJ2++3
31656 310 KT+KT+C2
31610 KT=1.5+3.14159++3/(4.0+KT)
31612 GOTO 314
31614 312 KT-1-5+8-0
31616 IF(TZ-EQ-0)GOTO 316
31619C SECONDARY AND "ENSILE HEMBRANE DEFLECTION
31680 314 YT-95+ZL5+ZL5/(KT+TZ)
31630 YFAIL=0-15+ZLS
31640 QFAIL=YFAIL+KT+TZ/(ZLS+ZLS)
31642 GOTO 317
```

```
31644 316 IF(TX-EQ-0)GOTO 318
31645C NO TENSILE MEMBRANE REINFORCEMENT -- SET YS=YT=YFAIL=HS 31646 YT=QS+ZLL+ZLL/(KT+TX) 31648 YFAIL=0+15+ZLL
31650 QFAIL=YFAIL+KT+TX/(ZLL+ZLL)
31651 317 IF(YT.LT.3.0+YU)YS=YT
31652 IF(YT-GT-3-0+YU)YS=3-0+YU
31653 GOTO 320
31654C NO TENSILE MEMBRANE HEINFORCEMENT - SET YS=YFAIL=HS
31656 318 YS=HS $ YT=HS $ YFAIL=HS $ QFAIL=0.0
31658C
31660C ADJUST LOAD-DEFLECTION CURVE FOR SLAB DEAD LOAD
31670 320 QDL=150.0+HS/172.0
31672 YDL=YU-YU+(1.0-(QDL/QU)++1.8)++(1.0/1.8)
31674 YU-YU-YDL $ YS-YS-YDL $ YT=YT-YDL $ YFAIL=YFAIL-:DL 31676 QU-QU-QDL $ QS-QS-QDL $ QFAIL=QFAIL-QDL
31678 IF(KRAND.NE.1)PRINT 633,QDL,YDL
31680C
31700C OUTPUT LOAD-DEFLECTION CURVE
31710 IF(KRAND-EQ-1)GOTO 335
31720 IF(Y5.EQ.YT)PRINT 660,QU,YU,QS,YS,QFAIL,YFAIL
31730 IF(YS.NE.YT)PRINT 660,QU,YU,QS,YS,QS,YT,QFAIL,YFAIL
31740 335 RETURN
31750C
31800 600 FORMAT(/*INPUT LS,LL,HS,F'C,FY,DIF(%)*,+)
31810 602 FORMAT( -INPUT LONGITUDINAL EDGE DISPLACEMENT (PER UNIT .
            *LENGTH)*/*IN SHORT AND LONG DIRECTIONS*,1)
31820 610 FORMAT(16.1)
31830 620 FORMAT(//*PROPERTIES OF LONGITUDINALLY RESTRAINED *
31840+ *REINFORCED CONCRETE SLAB*,/,* LS **,F6.1,* IN. LL **
31850+ F6.1,* IN.*,6X,*HS **,F6.1,* IN.*,/,* FDC **,F7.1,* PSI*,
               FDY =+,F8.1.+ PSI+)
31860+
31870 630 FORMAT(/*REINFORCEMENT VALUES*/ SECTION
                                 (P')*,7X,*D'*,/,8X,*(SQ IN-/FT)*,10X,
31880+
           7X.+D+.8X.+A'S
            *(IN.) (SQ IN./FT)*,10X,*(IN.)*)
31895 633 FCRMAT(/+QDL =+,F6.2,+ PSI
                                              YDL =+,F5.4,+ IN.+)
31900 640 FORMAT(I5,F11.4,+ (+,F5.4,+)+,F8.3,F10.4,+ (+,F5.4,+)+,
31910+
           F8.3)
31915 660 FORMAT(/#LOAD=DEFLEC' N CURVE##/##X##Q (PSI)
31916+
            /.(F9.2.F12.4))
31920 670 FORMAT(/*INPUT AS, D, APS, AND DP FOR FOLLOWING SECTIONS*)
31930 711 FORMAT(/*INPUT CONTINUOUS TENSILE MEMBRANE REINFORCEMENT *,
            *(SQ IN-/FT)*/*IN SHORT AND LONG DIRECTIONS*,+)
31990C
32000C ENTRY 3. DETERMINE THE RESISTANCE (PER UNIT AREA)
32010C
                     OF THE SLAB AS A FUNCTION OF Y(I)
32020C
32025 3 IF(Y(I).LT.0.OR.Y(I).GT.YFAIL)G0T0 530
32030 IF(Y(1).GE.YU)GOTO 510
32035 ZKLM=ZKLMP
32040C
32050C COMPRESSIVE MEMBRANE RESISTANCE
32060 Q=QU+(1.0-(1.0-Y(1)/YU)++1.8)++(1.0/1.8)
32090 RETURN
32100C
32110 510 IF(Y(1)-GE-YS)GOTO 520
32130C SECONDARY RESISTANCE
32140 Q=0.5*(QU+Q5+(QU-Q5)*COS(3.1416*(Y(1)-YU)/(Y5-YU)))
32170 RETURN
32180C
32190 520 IF(Y(1)-GT-YT)GOTO 525
3£192C
32194C PLASTIC RESISTANCE
32196 Q=QS
32198 RETURN
32200C
32210C TENSILE MEMBRANE RESISTANCE
38280 525 Q=QS+(Y(I)-YT)+(QFAIL-QS)/(YFAIL-YI)
38250 RETURN
32260C
32270C FAILURE (SET RESISTANCE TO VERY SMALL VALUE)
32260 530 Q=1E-11
32290 RETURN
```

THE THE PROPERTY OF STREET AND THE STREET OF THE PROPERTY OF T

PROGRAM RESTRAN (CONTINUED)

THE SECOND PROPERTY OF THE PRO

```
35000 SUBROUT: NE MOMENT (PV.I.FDY.FDC.HS)
         THIS SUBROUTINE CALCULATES THE ULTIMATE MOMENT CAPACITY FOR
35010C
        REGIRED SECTIONS INCLUDED ARE THE EFFECT OF IN-PLANE FORCES P. AN ECCENTRICITY E(I) FROM THE CROSS SECTION CENTERLINE.
35020C
35030C
35040 CJHMON /HOM/ AS(4),D(4),APS(4),DP(4),MU(4),R(4),
35050+ K1, K2, K3, EPSC, ES, FPS, KUD, E(4)
35060 REAL MU.KI.K2.K3.KUD
35090C
35100 IF(AS(I).EQ.0)GOTO 170
35110C: ALL PROPERTIES ARE COMPUTED FOR A UNIT WIDTH
35180 TENS-AS(I)*FDY*PV
35130 IF(APS(1).LE.0)GOTO 150
35140C
         SECTION HAS COMPRESSION REINFORCEMENT
35160 C=K1+K3+FDC+DP(1)
35170 TERM1=0.5+(TENS/APS(I)+ES+EPSC)
35180 TERM2=ES+EPSC+(TENS-C)/APS(1)
35190C: DETERMINE LUCATION OF NEUTRAL AXIS
35200 IF(TENS-LE-C)G0T0 140
35210C
35220C: KUD > D'
35230 FPS=TERM1+K3+FDC/2+0-SQRT((TERM1+K3+FDC/2+0)++2
35840+ -(TERM2+ES+EPSC+K3+FDC))
35850C: F'S MUST BE <= FDY
35260 IF(FPS-LT-FDY)GOTO 130
35270 FPS+FDY
35280 130 TPS=APS(1)*(FPS-K3*FDC)
35290 KUD=(TENS-TPS)/(K1+K3+FDC)
35300 MU(1)=AS(1)+FDY+(D(1)-K2+KUD)+APS(1)+FPS+(K2+KUD-DP(1))
              +PV+(0.5+HS-K2+KUD+E(1))
35310+
35320 RETURN
35330C
35340C: KUD < D'
35350 140 FPS=-TERM1-SQRT(TERM1++2-TERM2)
35360C: F'S MUST BE <= FDY
35370 IF(FPS-LT-FDY)GOTO 145
35380 FPS=FDY
35390 145 TERM3=TENS+APS(1)+FPS
35400 KUD-TERM3/(K1+K3+FDC)
35410 MU(1)=AS(1)+FDY+(D(1)-K2+KUD)-APS(1)+FPS+(K2+KUD-DP(1))
35420+
              +PV+(0.5+HS-K2+KUD+E(1))
35430 RETURN
35440C
35450C
         SECTION HAS NO COMPRESSION REINFORCEMENT
35460 150 TERM1=0.55*(ES*EPSC*PV/AS(1))
35470 FS=-TERM1+SQRT(TERM1+*2+ES*EPSC*(K1*K3*FDC*D(1)-PV)/AS(1))
35480 IF(FS-LT-FDY)GOTO 160
35490 FS=FDY
35500 160 IF(FS+LT++FDY)FS=-FDY
35510 NUD=(AS(1)*F5*PV)/(K1*K3*FDC)
35520 IF(KUD-GT-H5)PRINT,*KUD IS GREATER THAN HS*
355() MU(1)=AS(1)=FS=(D(1)-K2=KUD)+PV=(0.5=HS-K2=KUD+E(1))
35550 RETURN
35560C
35565C
         SECTION HAS NO REINFORCEMENT
35570 170 KUD-PV/(K1+K3+FDC)
35580 MU(I)=PV+(C+5+HS-K2+KUD+E(I))
35590 RETURN
35600 680 FOPMAT(*MU(*,11.*) **,F10.1,5X,*FPS **,F10.1,5X,
35610+
            35620 685 FORMAT(+MU(+,11,+) =+,F10-1,6X,+F5 =+,F10-1,5X,
            *KUD =*.F10.3)
35640 690 FORMAT(+HU(+,11,+) =+,F10-1)
35650 EMD
50000 SURROUTINE TRANS (B.ZLV.ZLH.KRAK.ZKLMP.VL1P.VL2P.VS1P.VS2P)
50030C
         THIS SUBROUTINE DETERMINES LOAD AND HASS TRANSFORMATION FACTORS AND DYNAMIC REACTION COEFFICIENTS FOR TWO-WAY RESTRAINED SLABS-VALUES CORRESPONDING TO PLASTIC BEHAVIOR ARE USED.
50040C
50050C
50060C
50070C
         LOAD AND MASS TRANSFORMATION FACTORS
50080C
50230
             IF(KRAK-EQ-1)GOTO 335
50235C
```

Will also a service of the service o

...

PROGRAM RESTRAN (CONTINUED)

ery of the contraction of the co

```
50240C: CRACK PATTERN A
           CVS=0.5+B
50260
           CVL=0.5*(1.0-B)
50270
           XP=ZLH+B/3-0
50290
           ZP=ZLV+(1.0-4.0+B/3.0)/(4.0+(1.0-B))
50310
           XBARP=0.5+B+ZLH
50320
           ZBARP=ZLV+(1./24.-B/16.)/(1./8.-B/6.)
           GOTO 390
50330
50340C: CRACK PATTERN B
50350 335
           CVS=0.5+(1.0-B)
50360
           CVL=0.5+B
50370
           XP=ZLH+(1.0-4.0+B/3.0)/(4.0+(1.0-B))
50390
           ZP=ZLV+B/3.0
           XBARP=ZLH+(1./24.-B/16.)/(1./8.-B/6.)
50410
50420
           ZBARP=0.5+B+ZLV
50770C
50780C: ALL CASES -- PLASTIC RANGE
50790 390 ZKMP=(1.0-B)/3.0
50600
           ZKLP=0.5-B/3.0
50810
           ZKLMP=ZKMP/ZKLP
50820C
50830C
50840C
        DYNAMIC REACTION COEFFICIENTS FOR SHORT (VS) AND LONG (VL) EDGES
50860C
51350C: ALL CASES -- PLASTIC RANGE
51360 460 VS1P=CVS+(1.0-XP/XBARP)
51370
           VS2P=CVS+(XP/XBARP)
51380
           VL1P=CVL+(1.0-ZP/ZBARP)
           VL2P=CVL+(ZP/ZBARP)
51390
51400
           RETURN
51410
           END
           SUBROUTINE RANDOM (IENTRY)
70000
70010C THIS SUBROUTINE INPUTS MEAN AND STANDARD DEVIATIONS FOR RANDOM
70020C VARIABLES: GENERATES RANDOM VALUES: CONTROLS REQUIRED
70030C NUMBER OF CASES TO BE RUN; AND OUTPUTS FINAL RESULTS AND SUMMARY
70040C
70050 COMMON KINC, LDTYPE, KRF, KRANE, TIME, I, Y(100), Q, QU, YU, YFAIL, FDC.
70052+
        ZLS, HS, FDY, AREA, ZMASS, ZKLP, VSI, VS2, PSO, PDO, PR, PEXT, PC, TC, TO,
70054+
        PO.DELAY.S.FPC.FY
70080
          COMMON /RAND/ TIMEC
70090 DIMENSION CH125(7), CH1975(7), TD15T(7)
70100C
70110C VALUES FOR 97.5% (F=19,24,29,34,39,44,49)
           DATA CHI25/-4688--5167--5533--5825--6065--6267--6440/
70120
70130
           DATA CH1975/1.7295,1.6402,1.5766,1.5284,1.4903,1.4591,1.4331/
           DATA TDIST/2.093.2.064.2.045,2.032.2.022.2.016.2.010/
70140
70150C
70160
           GOTO(5,50,70), IENTRY
70165C
70170C
        ENTRY 1: INITIALIZE RANDOM NUMBER GENERATOR
        5 XDUMMY=XNORM1(-1.0,0.0,1.0)
PRINT,/,/*INPUT NRAND*,
READ,NRAND
70180
70190
70200
70210
           DO 47 I=1, KRAND
70220
           XDUMMY=XNORM1 (0-0,0-0,1-0)
        47 CONTINUE
70230
70240
           INDEX=0$ SPS0=0$ SSPS0=0
70250
           ICHECK=20
70260C
70270C
        INPUT MEAN AND STANDARD DEVIATION FOR RANDOM VARIABLES
70275
           IF(KRF.EQ.0)GOTO 30
70280
           PRINT 87
70290
           READ, SMEAN, SSD
70410C
       REINFORCED CONCRETE SLABS
70420
       30 PRINT 86
           READ, FYMEAN, FYSD PRINT 85
70430
70432
           READ, FPCMEAN, FPCSD
70434
           IF(KRF.EQ.1)PRINT 96
70440
           IF(KRF-EQ-0)PRINT 97
70445
70450
           RETURN
70460C
70470C
       ENTRY 2: GENERATE RANDOM VALUES
       50 FY=XNORM1(0.0,FYMEAN,FYSD)
70570
```

The state of the s

PROGRAM RESTRAN (CONTINU

```
70580
            IF(FY-LE-0)GOTO 50
70562
           FPC-ANORMI (0.0, FPCMEAN, FPCSD)
70583
            IF(FPC.LE.O)GOTO 55
70585
            IF(KRF.EQ.O)GOTO 65
70590
       60
           S-XNORM1 (0.0, SMEAN, SSD)
70600
           IF(S.LE.O)GOTO 60
INDEX=INDEX+1
70610
70620
            RFTURN
70625C
70630C
        ENTRY 3: SUM VALUES OF PSO AND PSO**2 FOR USE IN
76335C
                   STATISTICAL ANALYSIS
70640
      70
           SPS0=SPS0+PS0
70650
            SSPS0=SSPS0+PS0+PS0
70660C
70670C OUTPUT FINAL RESULTS
           IF(KRF.EQ.1)PRINT 92,FDY,FDC,S,PSO,TIMEC IF(KRF.EQ.0)PRINT 90,FDY,FDC,PSO,TIMEC
70730
       76
70735
70740
            IF (INDEX-LT-ICHECK) RETURN
70750C
70760C DETERMINE MEAN, STANDARD DEVIATION, AND STANDARD ERROR FOR PSO
70770
           ZNO-INDEX
70780
            ZMEAN+SPSO/ZNO
70790
            SD=SQRT((SSPSO-ZNO+ZMEAN+ZMEAN)/ZN(-)
70500
            STDERR-SD/(SQRT(ZNO-1))
70810C CHECK IF MAXIMUM OF 50 PSO SAMPLES OBTAINED
70820
            IF(INDEX-EQ-50)GOTO 62
70830C CHECK IF 95% CONFIDENCE INTERVAL FOR at the PSO VALUE IS
70840
            IF(STDERR+TD:ST((INDEX-15)/5)/ZF
                                                  .GT+0+102G0T0 61
70850C
70860C CONFIDENCE INTERVAL IS WITHIN 10% -- DETERMINE UPPER LIMIT OF
70870C 95% CONFIDENCE INTERVAL FOR STANDARD DEVIATION
70880C PROBABILITY VALUE AND ITS 95% CONFIDENCE INTERVAL UPPER LIMIT
        62 SDU=SD/(SQRT(CH125((INDEX-15)/5)))
70900C CHECK IF MAXIMUM OF 50 PS0 SAMPLES OBTAINED
70910
           IF(INDEX-EQ-50)GOTO 53
70980C CHECK IF UPPER VALUE OF 95% CONFIDENCE INTERVAL FOR STANDARD 70930C DEVIATION IS WITHIN 0-10-MEAN OF THE STANDARD DEVIATION
70940
            IF(((SDU-SD)/ZMEAN)-GT-0-10)GOTO 61
70960C 95% CONFIDENCE INTERVAL IS WITHIN 10% FOR BOTH MEAN AND 90%
70970C PROBABILITY VALUE -- THEREFORE SUFFICIENT SAMPLES OBTAINED
70980C DETERMINE 95% CONFIDENCE INTERVALS FOR MEAN, STANDARD DEVIATION
70990
71000C AND 10% AND 90% PROBABILITY VALUES
        53 ZMEANL=ZMEAN-STDERR+TDIST((INDEX-15)/5)
71010
71020
           ZMEANU=ZMEAN+STDERR+TDIST((INDEX-15)/5)
71030
            SDL=SD/(SQRT(CH1975((INDEX-15)/5)))
71040
           P10-ZMEAN-1-282+SD
71050
           PIOL=ZMEAN-1-282+SDU
71060
           P10U=ZMEAN-1.282+SDL
71070
           P90~ZMEAN+1-282+SD
71080
           P901.=ZMEAN+1.282+SDI
7:090
           P90=ZMEAN+1 - 282+5D
            P90U-ZHEAN+1.282-SDU
71100
71110
            P90U-ZMEAN+1-282+SDU
71120C
71130C OUTPUT STATISTICAL PARAMETERS OF INCIPIENT COLLAPSE PRESSURE
71140
           PRINT 100, ZHEAN, ZHEANL, ZHEANU, SD, SDL, SDU, P10, P10L, P10U,
            P90,P90L,P90U
PRINT 105,INDEX,STDERR
71150+
71160
71170
            GOTO 999
71180C
71190C
       95% CONFIDENCE INTERVAL IS NOT WITHIN 10% FOR BOTH HEAN AND 90
71200B
71810C
       VALUES -- THEREFORE OBTAIN 5 ADDITIONAL SAMPLES
         61 ICHECK-ICHECK+5
71220
71230
            RETURN
71840C
71260
       85 FORMAT(/+INPUT MEAN AND STANDARD DEVIATION FOR F'C+,+)
       56 FORMAT( / SINPUT NEAN AND STANDARD DEVIATION FOR FY ... +)
71270
71280
       8/ FGRMAT(/-INPUT MEAN AND STAMDARD DEVIATION FOR S+,+)
71290
       90 FORMAT(2F9-1,F10-2,F14-3)
71310
       92 FORMAT(2F9-1,F11-2,F10-2,F14-3)
       96 FORMAT(///.5X.+FDY+.6X.+FDC+.8X.+S+.8X.+PSO+.6X.
71350
```

A comparation of the contract of the contract

norman source and the endowed the contract of the contract of

大学 かんし

PROGRAM RESTRAN (CONCLUDED)

and the second property of the second second

nennendelinderförberingber förndikken unn man stattstäterine könkönnen kanniköm settation med ette mensan.

RCBEAM

Reinforced Concrete Support Beam

PROGRAM RCBEAM

对这个大型的时

Section of the second

```
00100 PROGRAM RCBEAMICINPUT- BUTPUT- TAPE1)
00105 CALL RETRY THROBEAMS, THROBEAMS)
00110C * THIS PARTIAN OF THE PRAGRAM INPUTS THE REQUIRED ELEMENT 00115C: AND LOAD DATA AND INITIALIZES CEPTAIN PARAMETERS *
001200
00150 COMMON KINC, LOTYPE, KRF, KRAND, TIME, I. (100), QT, QU, YU, YFAIL,
         ZLB, 99, HB, FPC, FDY, 1CASE, AS(4), APS(4), D(4), DP(4), FDC,
00154+
         EC. ES. GAREA, PAREA, ZMASS, ZKLM, VL1, VL2,
         MEMA, ASCS, VOL, 20L SLAR, 4C3MP, HS, HS, NSLABS, NAMEF(2), 4L740,
00155+
         W. P3. C3. L3C. S. ZL EN. CD. PS3. PUB. PR. PEXT. PC. TC. TO. DELAY.
00155+
00157+
         TT(80,2), PP(80,2), REAC(80,2), [NOEx(2), BR(2),
         WIN. RH33, V3, L1, 44(9, 2), NN(8), AFRONT, ASIDE, G, G2, G3, G4, PP2, OT
00160 LOGICAL LI
00165C
001700 * READ TITLE AND CONTROL PARAMETERS
00172 PRINT 67
00174 READ 68. TITLE
00174 PRINT 720
00175 READ, NSLABS, KLEAD
00180 PAREA=0
00182 IF(YL#AD-E9-0) G8T9 40
90184C
001860: INPUT SLAB REACTION DATA FILE DATA
00188 PRINT 725
00190 00 39 J=1,NSLA9S
00192 PRINT 735,J
00194 READ, NAMEFOUR, ISIDE
00196 CALL PEURCHHET, 1, NAMEE(J))
00198 IF(ISIDE-EO-1)READ(1.)SAREA.DUM.HS
00200 IF(ISIDE-E9-2)READ(1.)DUM. SAREA. HS
00202 510 INDEX(J)=1
TVIENK(1) DAZA 40500
00206 IF(ISIDE-E0-2)G3T3 520
00208 515 READ(1,)(TT(JJ, J), PP(JJ, J), REAC(JJ, J), DUM, JJ=1, NP3INT)
00210 GOTO 525
00212 520 READ(1,)(TT()], )), PP()], )), 0)JM, REAC()], )), JJ=1, MP01NT)
00214 525 BR(J)=(REAC(2, J)-REAC(1, J))/(T[(2, J)-TT(1, J))
00216 BP=(PP(2, 1)-PP(1, 1))/(TT(2, 1)-TT(1, 1))
OOZIR REWIND I
00220 CALL DR3P1(1)
00221 9DLSLAB=9DLSLAR+150+0* SAREA*HS/1728+0
00222 39 PAREA=PAREA+SAREA
00224 KING=0 $ LOTYPE=5 $ KRF=0 $ KRAND=0
00226 S3T2 45
002280
00230C INPUT TRIBUTARY SLAB DATA
00232 40 PRINT 730
00234 D7 42 J=1, V$L495
00236 PRINT 735, J
00238 READ, SAREA, HS
00240 00LSLAB=30LSLAB+150+0*SAREA+HS/12+0
00242 42 PAREA=PAREA+SAREA+144.0
00244C
00246 PRINT 85
00248 READ, KINC, LOTYPE, KRF, KRAND
00250 45 CONTINUE
00252 DELAY=0
00254 67 FORMAT(/#INPUT TITLE***)
00256 68 F9RMAT(A59)
00258 85 FORMAT(/*INPUT KINC,LDTYPE, KRF, KRAND(1=RAND3M)+,+)
00260 720 FURNAT(/*INPUT NUMBER OF SLAGS SUPPORTED BY GEA4, AND IF *, 00262* *SLAG REACTIONS*/*ARE TO BE CALCULATED (0) OR READ FROM *, 00264* *OATA FILE (1)*,*)
00266 725 FORMAT(/*INPIT REACTION DATA FILE NAME AND SIDE *.
            *(1=SH3RT, 2=L3NG)+)
00270 730 FORMAT(/*INPUT CONTRIBUTARY AREA ($2 FT) AND THICKNESS (IN-)*)
00272 735 FØRMAT(6x. +FØR SLAB N9. +. 12,+)
002740
60276C * INPUT AND ECHS BEAM AND REINFERCEMENT PROPERTIES *
00278 PRINT 615
00280 READ, ZLB, BB, HB, FPC, FDY, I CASE, 4CAMP
00282 ICASE4=1CASE-4
00284 FDC=1-25*FPC
00286 EC=57619.0*SQRT(FPC)
```

```
00288 ES=29E6
00290 GAREA= (LR+88
PAREA-PAREA-DAREA
00294 ECKIP=EC/1000.0 $ FSKIP=ES/1000.0
00296 11 PRINT 670
$15.1×1 F FG 82500
0=(1)2A 00E00
00302 IF(ICASE-E0-5-AND-I-GT-1) 5713 9
00304 PRENT 625.1
CCCC6 YEAD, AS(I), D(I), APS(I), DP(I)
00307 % CANTINUE
00308 IFCKC8MP+E9+0) G3 [3 3
00309 PRINT 616
GOSTO READ, SP. HS. ASSLAS, DSLAS
06311 95=0.25+7LR
00312 [F(95.GT.(99+16.0+45))95=93+16.0+45
00313 IF(B2.GT.SP)95=SP
00314 9 PRINT 711
00315 READ, MEMB
00316 TF(MEMB.NE.1) GBT3 15
00317 13 PRINT 705
00318 READ.ASCS
BUNTINED 21 08E00
00322 PRINT 620,1CASE, ZLB, BB, HB, FPC, FDC, ECKIP, FD/, ESKIF
00323 IF(403MP+ME+0)PRINT 621+44-95+5P
00324 PRINT 630
00326 D3 110 1=1.3.2
C0328 IF(ICASE, 59.5.ANR. 1. GT-1) 63 T3 110
00330 P=AS(1)/(89*0(1)) $ PPR=APS(1)/(88*0(1))
00332 PRINT 640,1,45(1),P,0(1),4P5(1),PPR, 1P(1)
30111463 011 88800
00334 IF(4C84P+57+0)(8818 115
00335 PRINT 641, ASSLAS, DSLAS
00336 IF(ASSLAB. E9.0) GATA :15
00337 ASSLAB=85*ASSLAB/12.0
00338 DP(1)=(APS(1)+DP(1)+ASSLAB+DSLAB)/(APS(1,+ASSLAB)
00339 APS(1)=APS(1)+ASSLAB
00340 115 ZMASS=150+0*ZLB+HB+BB/(386+07+1728+0)
00342 VCL=2.28*53RT(FPC)/(1-2*D(1)/ZLB)+3000*(A5(1)/(BR*D(1)))/(1-D(1)/ZLB)
00343 VCL 4AX-3-5=SORT(FPC)/(1-(-2-0+0(1)/7Lb)
00344 1F(VCL)GT-VCLM4X)VCL=VCLM4X
00345 PRINT (8 - VCL
00348 615 F3RMAT(/*INPUT LB,9B, MR, FPC, FUY, ICASE, (C3MP*,+)
003-7 616 F9RMAT(/*INPUT BEAM SPACING, MS, AS(SLAG), & O(SLAB)*,+)
00350 625 F3RMAT(*INPUT AS, D, A'S, &D' F3R SECTI®N*, I2,+)
00352 620 F3RMA:(//*PP3PERTIES 3/ REINFØRCED CANCRETS SUPPMRT BEAM --*,
00354
               . VISI. * . NO SALL TERAGIS *
               * LB =*,F6.1,* IN. RB =*,F6.1.
F6.1,* IN.*,/-> F'C =*,F7.1.* PSI
                                             RB =*, F6.1, * It. *. 64, *H9 =*, F7.1. * PSI FDC =*, F7.1,
00356+
 00358+
                * PSI*,5X,*EC =*,F7.1,* (SI*,/,* FDY =*,F8.1,* PSI*,
 00360+
00362+ 3X.+ES.+F9.1+* (SI*)
00364 A30 F3RM4T(//*REINF3RCEMENT VALUES*/* SECTION
                                                                              (P)*,
                                   (P1)4, dx, 40'4/9x, 4(50 IV.)+, 12x,
             9X, +D+, 8X, +A'S
 00366+
                        (50 14.)*,12x,*(14.)*)
 99568+
             *(IV.)
 00370 675 FRMAT(1H )
 00372 645 FORMAT(/. *VCL =*, F6.1. * PSI *)
00374 705 FARMAT(/*INPUT CONTINUOUS REINFARCEMENT (SO IN-)*,*)
00376 711 FARMAT(/*IS TENSILE MENARANE TO BE INCLUDED (0=40)*,
             +1=YES) +++)
 00378+
 00380 640 F3RM4TCI5,F1:.4** (*,F6.4;*)*;F9.3;F10.4;* (*,F6.4;*)*;F9.3)
 00392 624 FRRMAT(* HS =*,F6.1.* 14. H
00384+ SX,*9EAM SPACING =*,F6.1.* 14.*)
                                                  BS =**F5.1,* 14.4,
                         &AB*+F10+4+ SQ [N-/FT++F9+3)
 OGSR6 641 FORMAT(*
 005650
          INPUT LOAD PARAMETERS
 005700
 00571 IF(LDTYPE-F7-5) 6173 20
 GOSYSC LOCATION 1. FRONT FACE LOADING (USED IN ROOM-FILLING PROCEDURE)
 00580 IF(4L8AD.E9.1.69T) 25
 00595 1G0 W=1000+0 5 P3=14+7 $ C8=1120+0
 00590 IFCARF. NE-1) 63T0 102
 00595 LØC#1
 00600 IF(KRAND.EG.1) GTTJ 106
 00605 PHINT 600
```

The second second

```
00610 READ, S
00615 GOTO 103
00620C LOCATION 2. TOP FACE LOADING
00625 102 CD=0 $ L0C=2
00630 ZLEN=ZLB/12.0
00635 105 IF(KINC+50+1) 69T9 106
00640 PRINT 610
00645 READ PS7
00650 PR=2.0*PS3*(7.0*P3+4.0*PS3)/(7.0*P3+PS3)
00655 600 F3PMAT(/*INPUT S*,+)
00660 610 FORMAT(/*INPUT PSA*,+)
00665C
006700 * INPUT RRAM-FILLING PARAMETERS *
00675 106 1F(KRF.E0.0) 6777 20
00680 10 PRINT 700
00685 RH33=0.076 $ L1=.FALSE-
00690 DELAY=1E10
00695 READ, NHIN, V3
00700 AT=05 AFRONT=05 4510E=0
00705 DØ 18 I=1.NWIN
00710 PRINT 710.1
00715 READ, AA(I,1), NY(I), AA(I,2)
0.0001/(2.1)AA=(1.2)/1000.0
00725 AT=AT+A4(I.1)
00730 M=NN(1)$ G3T3(12,14,14),M
00735 12 AFR9NT=AFR8NT+AA(1,1)
00740 GOTO 18
00745 14 ASIDE=ASIDE+AA(1.1)
00750 18 [F(AA(1.2).LT.DELAY)DELAY=AA(1.2)
00755 AFRUNT=AFRUNT/AT$ ASIDE=ASIDE/AT
00760 700 F7RMAT(/*INPUT NWIN AND R73M V3LUME (CF)*,+)
00765 710 F3RMAT(/*INPUT AREA (SO FT),L3CATION CODE & DELAY(MSEC)*
00770+
           + FOR WINDOW+, 12,+)
00775 G=1.4 $ G2=1./G $ G3=1.-G2 $ G4=2./G3 $ G5=G+1.
00780 PP2= 1912
00785 C=SQRT(G*P0*32.*144./RH39)
00790 TAU=2.*(V3**(1./3.))/C
00795 DT=TAU/4.0
003000
00905 20 CONTINUE
DORTO 25 CALL CHAIN (RCBEAM2)
00815 99 STOP
00820 END
O1000 SEGMENT ROBEANS (INCUT. BUTPUT, TAPSI)
DINIOC THIS SECRENT CALCULATES THE RESISTANCE FUNCTION AND GIOROC LOADING AND SOLVES THE DYNAMIC EQUATIONS OF MOTION
016300
01050 CSHIAN KINCALDTYFE, (RF, KRAND, TIME, I, YC100) OT, OU, YU, YFAIL,
         ZLB, BB, HB, FPC, FDY, (CASE, AS(4), APS(4), D(4), DP(4), FOC.
C1052+
         EC. ES. GAREA, PAREA, SHASS, TKLA, VL. 1, VL. 2,
01054-
01055+
         4548, ASCS, VCL - 25LSLAB, 4C34P, HS, BS, VSLABS, VAHEF(2) - 4LOAD,
01056*
         dr Pa, Ca. Lac. S. El.E4, CD. PSJ. PDa, PT. PEXT. PC, TC. TO, DELAY,
31057+ T(80.2), PP(80.2), REAC(80.2), INDEX(8:. BR(2),
01059 N414, PHES, V3.LL.AA(8, 2), N4(E), AFRONT, ASIRE, G. G2, G3, G4, PP2, DT
01078 COMMON /RAND/ TIMEC
DIORG PIMENSIAN ACROSSICADS LCBOSSICACIOS ACCROSSICACIO
0119GC
0:250 IF(KING.NE-1-9R-LDTYPE-E0-3)CALL FORCE(!)
01240 14 IF(4RAYD:4E-1)60T0 35
            CALL RAYDRA(1)
CALL RAYDRA(1)
CALL RAYDRA(2)
CALL RESIS(())
01270
G1280
01290 34
01300 35
013105
DIBERCE MINIMUM. MAKIMUM. AND STARTING PALUES ARE GETERMEN
O133GC: SMERE THE LOAD CAUSING INCIPIENT COLLAPSE IS TO BE FOIND 01340 13 IF<<1NC.ED.-0) 08TO 23
01340 13
01350 PF=4.0
              PFYAX=0
01360
01370
             PF4IN=0
            0019 20
PF=(2F4{N+PF4AX)/2.0
01340
01390 15
01460 20
             CAL FERCE(2)
             IFERRF.EG.C'RATA 24
```

mark to the state of the

. n a a a ser

```
01420
             CALL FILL (PINT, 2)
01430C
01440C:
          INITIALIZE VALUES FOR BETA METHOD (BETA=1/6) AND COMPUTE VALUES
01450C: FOR FIRST TIME INTERVAL ASSUMING FLEMENT INTIFALLY AT REST
01460 24
01470
              TIME=0
21 450
             V(1)=0 $ Y(1)=0
01490
              DEL TA=0.001
01500
             IF (KRE-NE-1) GATA 30
01510 27
             IF(TIME-GE-(DELAY--00001))63T8 30
01520
             TIME=TIME+DELTA
01530
             CALL FILL(FINT.3)
01540
             G3T3 27
01640 30
             CALL RESIST(2)
             A(1)=0.0 $ VS(1)=0.0 $ VL(1)=0.0
01650
             T(1)=T[45
01660
016900
01690C: PRICEDURE FOR ALL SUBSECUENT TIME INTERVALS
01700 1
01710
             IF(1.1.T-101)G3T3 11
             PRINT 98, TIME
01730 98 F3RMAT(/I=101) TIME =+, F6.3,+; FAILURE ASSIMED TO WAT OCCUR+)
01740
             क्षाम्य ६
01750 11
             TIME=TIME+DELTA
G1760
              T(I)=TIME
01770
              A(I)=A(I-1)
             IF(KRF.NE.0) 0013 10
01775
01750
             CALL FORCE(3)
             PV(I)=PEXT
01790
C1800
             GOTO 2
018080 DIMENSION AC100>, VC100>, TC100>, VCC100>, PNC100>
01880 10 CALL FILL(PINT, 3)
             PM(I)=PINT
01890
01910 2 IF(KLBAD.EQ.O:PT=PN(I)*PAREA
01915 IFCKLOAD. NE. O) PT=PY(I)
01920
             D8 8 JJ21:10
01930
              Y(1)=Y(1-1)+DELTA+V(1-1)+DELTA+DELTA+(A(1-1)/3++A(1)/6+)
01940
              CALL RESIST(2)
01960 4 ANEW-(PT-0T)/(ZHASS#ZKLK)
01970
             ADELTA=AVEN-A(1)
              A(I)=AYEW
01980
01985 IF(AVEN-E3-0)PRINT-+1985+, TIME, PT- 0T- 2MASS- 24LM- Y(1)-A(1-1)
01990
             IF(ABS(ADELTA/(AVEW+1E-10)).LT.0.01) (317) 9
02000 9
              CONTINUE
03010
              ACID#ANEW-ADELTA/2.0
GPORO PRINT SO, TIME, PF, A(I), Y(I)
92039 9
              CONTINUE
82040
              Y(1)=Y(1-1)+DALTA*V(1-1)+USLTA*DELTA*(A(1-1)/3.+A(1)/6.)
02050
               V(1)=V(1-1)+DFLTA+(A(1)+A(1-1))/2.0
02070 VL(1)=VL1+PT+VL2+0T
92090C
021000: CHECK FOR MAXIMUM DEFLECTION OF FAILURE
021100: IF MAXIMUM DEFLECTION REACHED, HALL DID NOT FAIL
02120 IF(Y(I)-LE-Y(I-1)-ANG-PN(I)-LE-PN(I-1))GOTO 6
02130
             1F(Y(1)-LT-0) 0010 6
02135
             IF(Y(I).GE.YFAIL)GOTO 7
02140
             IF(TIME-DELAY-GE-0-010) DELTA=0-002
             IF(TIME-DELAY-GE-0-020) DELTA=0-005
IF(TIME-DELAY-GE-0-107) DELTA=0-010
05190
021 70
            IF (TIME-DELAY-GE-0-500) DELTA:0.050
IF FAILURE DEFLECTION REACHED. ELEMENT FAILED
02140
0219001
055500
02230C: INTERVAL HALVING PROCEDURE TO DETERMINE LOAD CAUSING INCIPIENT 02240C: COLLAPSE FOR CASES WHERE DESIRED 02250C: ELEMENT DID NOT FAIL -- SET PENIN TO PE
02260 6
             CANTINUE
02230
             IFCKINC-E2-0) GITA 18
96 06520
             PSMINAPE
02300 IF(FFMAX.GT.0)G3T3 16
U231U
             PF=2.0*PF
            COTO 20
SLCHENT FAILED -- SET PEMAK TO PE
02320
0233GC:
             SUVITING
02340 7
```

The state of the s

· Adaptication "

```
02350
             CIMEC=TIME
02370
             IF(KINC-E0-0) 33T3 18
02380 37
             PF4AX=PF
023900:
            CHECK TO SEE IF LOAD RANGE IS WITHIN DESIRED ACCURACY
             IFC(PEMAX-PEMIN)/PEMAX.GT.O.013GTT 16
02400 17
02410
             IF(KRAND.NE.1) GOTS 18
02420
             CALL RAYDBY(3)
02430
             G0 T0 34
02440C
02450C: OUTPUT DATA INCLUDES THE MAXIMM DEFLECTION AND TIME OF 02460C: JCC/RANCE FOR A NON-FAILING ELEMENT OR THE TIME AND VELOCITY 02470C: AT COLLAPSE FOR A FAILING ELEMENT. OPTIONAL OUTPUT IS THE
02480C: ENTIRE BEHAVIOR TIME-HISTORY.
02500C: BUTPIT LBAD DATA
02510 19
               ALL FORCE(4)
025200
02530C: OUTPUT FINAL RESULTS
02540 IF(Y(I).LT.YFAIL)PRINT 70,Y(I),T(I)
02550 IF(Y(1) - GE-YFAIL) PRINT 71, T(1), V(1)
02578C CHECK TO SEE IF ENTIRE TIME-HISTORY IS DESIRED
02580 PRINT 72
02590 READ.4
02690 25 PRINT 77
02740 70 FORMAT(/*NØ FAILURE - MAX DEFLECTION OF*, F6.2,
02750+
            . IN. REACHED AT*F7.3, * SEC+)
02760 71 FORMAT(/*FAILURE OCCURRED AT*, F7.3, > SEC (FINAL VELOCITY =*,
          F7.2* [%./SEC)*)
02770+
02700 72 FORMAT(/*IS TIME HISTRRY DESIRED (YES=1, NB=0)*,+)
02830 76 FORMAT(/* TIME PRESSURE ACCELERATION VELOCITY *
02840+ *DISPLACEMENT VL+//
02850+
           (FC-3,F9-3,F12-1,F12-2,F12-4,F11-0))
02860 77
              F3RMAT(///, 7(*----*))
02870 80 FORMAT(/*ACCELERATION NOT CONVERGING AT TIME #*, F6.3,
                   * SEC (PF =*,F7-3,* PSI)*/*
02580+
                                                         A(I) SET EQUAL TO.
02890+
                   F9-1+ (AVG OF LAST 2 ITERATIONS)+/+
                                                                   Y(1) =+.
02900+
                   F8.4.+ IV.+)
029500
02960 999
              STOP
02970
             END
10000 SUBROUTINE FORCE(IENTRY)
10010C THIS SUBRAUTINE INPUTS THE LOAD PARAMETERS AND DETERMINES 10020C THE LOAD AT A GIVEN TIME FOR THE FOLLOWING LOAD TYPES: 10030C 1. IDEALIZED BLAST LOAD (FRONT OR SIDE FACE) 10050 COMMON KING, LOTYPE, KRF, KRAND, TIME, I, Y(100), 9T, 9U, YU, YFAIL,
         ZLB, BB, HB, FPC, FDY, ICASE, AS(4), APS(4), D(4), DP(4), FDC,
10052+
10054+
         EC. ES. GAREA, PAREA, ZMASS, ZKLM, VL1, VL2,
10055+
         MEMB. ASCS. VOL. 20LSLAB. KG3MP. HS. BS. NSLABS. NAMEF(2). KLBAD.
10056+
         W.Pa, Ca, Lac, S, ZLEN, CD, PSa, PDa.PR, P, PC, TC, TO, DELAY,
         TT(RO.2).PP(SO.2..REAC(RO.2).(NDEX(2).BR(2).
10057+
         WHIN, RHOO, VO.LI. AA(S. 2), NY(S), AFRONT, ASIDE, G. G2, G3, G4, PP2, DT
10054+
100800
10130 IF(LDTYPE.EG.5) 68T7 700
10135 IF(KL8AD-E9-1) (8T9 500
10140C
10150 G3T%(215,200,300,4), IENTRY
110000
         CALCULATE LOAD PROPERTIES FOR GIVEN PEAK PRESSURE
11010C
11050 GPT9 215
11060 210 F50=PR
11070 215 PD0=2.5*PS0*PS0/(7.C*P3+PS3)
11050 U=C0+SQRT(1.0+(6.0+P50)/(7.0+P0))
11090 T0=W**0.3333/(2.2399*0.1886*P50)
11100 5813(220,225),LCC
11110 220 TC+3.0+S/U
11120 PC=PS0+(1-TC/T0)+EXP(-TC/T0)+PD0+(1-TC/T0)++2+EXP(-2+TC/T0)
11130 CD=1.0
1114G RETURN
```

```
11150 225 TA= (LEN/U
11160 TAZ=TA/2.0
11170 TARTO= TAR/ TO
11180 PA=PS3*(1-TA2TO)*EXP(-TA2TO)*CD*PD3*(1-TA2TO)**2*EXP(-2*TA2TO)
11190 RETURN
15000C
        CALCILATE LOAD
12010C
12030 300 GJT3(305,310),LAC
12040 305 TT0=f14E/T0
12050 [F(TIME.GT.TC)69T9 320
12060 P=PC+(TC-TIME)+(PR-PC)/TC
12070 RETURN
12090 310 TTO=(TIME-TA2)/TO
12090 IF(TIME-GT-TA)@TØ 320
12100 P=PA+TIME/TA
12110 RETURN
12120 320 IF(TTO-GE-1-0)GJT3 330
12130 P=PS7+(1-TT0)+EXP(-TT0)+C9+PD3+(1-TT0)++2+EXP(-2+TT9)
12150 RETURN
12160 330 P=0
12170 RETURN
13000C
13010C PRINT LIAD DATA
13020 4 IF((INC-E0-0) GOTO 400
13030 PRINT 640.LOTYPE
13040 GOTO 410
13050 400 PRINT 645.LDTYPE
13060 410 CONTINUE
13070 415 G9T3(420,425),L9C
13080 420 PRINT 650
13090 G9T3 430
13100 425 PRINT 655
13110 430 PRINT 660. W. P7. C7
13120 IF(KRAND.NE.O)RETURN
 13130 G3T3(435,440),L0C
 13140 435 PRINT 665, S. TC. PR
13150 GOTO 445
13160 440 PRINT 670, ZLEN, TA, PA
13170 445 PRINT 675, IJ, TO, CO, PSJ, PD7
 13190 RETURN
13510C L3A0 TYPE 5 -- ARBITRARY 1,3A0 SHAPE 13520 700 G3T3C710.720.730.740). LENTRY 13530C
 135400
          TAPUE LJAD DAFA
 13550 710 PRINT 730
13560 READ, NOWINT, (TT(J,1), PP(J,1), J=1, NP3INT)
 13570 FACT3R=1.0
 13590 IF(KINC.EQ.O)6313 718
13599 PMA(=PP(1,1)

13600 D3 715 J=2, WP3INT

13610 715 IF(PP(J,1),GT,PMA()PMAX=PP(J,1)

13620 714 PX=PP(2,1)-PP(1,1)
 13630 TK=TT(2,1)-TT(1,1)
 13640 31=1
 13650 RETURN
 13650C
 13670C CALCULATE MAXIMUM LOAD
13680 720 FACTSREPRIPMAX
 13690 GTT3 719
 13700 RETHRY
 137100
 13720C CALCULATE L34D
 13730 730 IFCTIME=UE=TFC(IJ+1+1)) G1T7 735
13740 IJ=JJ+1
 13750 PK=PP(JJ+1+1)-PP(JJ+11
 13760 TX=TT(JJ+1+1)-TT(JJ)
 13765 IF(TX-E7-0)TX=1E-10
 13770 G3T3 730
13790 735 P=FACT4R*(PPCJI+1)+(T[M5-TT(JI+1))*PX/IX*
 13790 RETURN
 13300C
 13410C PRINT LAAD DATA
 13915 740 IFCKING-59-1) PRINT 640-LDTYPE
```

The state of the s

The state of the s

WHAT STATE

```
13820 IF(KINC-EO-D)PRINT 645, LUTYPE
 13825 PRINT 790
 13830 D3 745 J=1, NP3INT
13840 P=FACT3R*PP(J+1)
 13850 745 PRINT 795, TT(1,1),P
 VELIER OFFE!
 14000C
 14070 640 FORMATCHEDAD CAUSING INCIPIENT FAILURE IS AS FALLSWS: ..
 14071+
            1.54. . LOAD TYPE VIMBER. 12)
 14090 645 FORMATC/*PROPERTIES OF LOAD ACTING ON WALL ARE AS FULLOWS: ..
 1406.+ //5X/+L340 TYPE NUMBER+/12)
1-090 650 F3RMAT(5X/+(FR3NT F3CE)+)
 14100 655 FOR MATICSY, + (SIDE OR TOP FACE)+)
 14110 660 F3RMAT(10X, *W =*, F4. 1, * 4T P3 **, F6. 2, * PSI
 14111+
            F7-1.* FPS+)
 14120 645 F7RMAT(10X, + S = +, F6.1, + FT
                                                 TC =*.F6.3.* SEC
                                                                          PR =4,
            F7-3, + PSI+)
 14121+
 14130 670 FARMATCIOX.*L =*.F6.1.* FT
                                                 TA =*, F6.3, * SEC
            F7.3.4 PSI+)
 14140 675 FØRMAT(10X, +U =+, F7-1, + FPS TO =+, F6-3, + SEC
                                                                        CD =*.
           F5-1-/-84-4PS0 =4.F7-3.4 PS1 PD3 =4.F7-3.4 PS14)
 14141+
 14150 780 FARMAT( / * INPUT NUMBER OF LOAD POINTS AND THE TIME AND *
 14151+ *PRESSURE AT EACH PRINT+)
14160 790 FRMAT(/10x,+TIME PR
                                       PRESSURE*)
 14170 795 FØRMAT(F15.3.F12.2)
 1 5000C
 15002C:
          SLAB REACTION DATA
15010 500 G3T8(510, 530, 540, 560), IENTRY
15020 510 RETURN
 15095C
 15090 530 ST3P
15095C
 15100 540 P=0+0
15110 D3 555 Jalang.ARS
15115 545 JJ=INDEX(J)
15120 550 IF(TIME-LE-TT(JJ+1,J)) G3T3 555
15125 [ NDEX( ]) = [ NDEX( ]) +1 $ ] ] = [ NOEX( ])
15130 IFC | | LT. NP3 | NT) G3T3 552
15132 PRINT 690. TIME
15133 STOP
15135 558 BR(J)=(REAC()]+1,))-REAC()],))/(TT()]+1,J)-TT(JJ,))
15140 BP*(PP(JJ+1, J)-PP(JJ, J))/(TT(JJ+1, J)-TT(JJ, J))
15150 G0 F0 550
15160 555 PEP+REAC(J), J)+(TIME-TT(J), J))+BR(J)
15165 P=P+QAREA+(PP()), ))+(TIME-TT()), ))+BP)
15170 RETURN
15180 560 PRINT 680
15190 D8 565 J=1. NSLARS
15200 565 PRINT 685, NAMEFOLD
15300 680 FARMATO/#BEAM LBADED WITH REACTIONS FROM FILE(S):#)
15310 685 F2RMAT(10X,A7)
15315 690 FRE4AT(/*END RF FILE -- BEAM HAS NOT FAILED AT*, F6.3, * SEC*)
15320 RETURN
15330 EVD
20000 SUBRUUTINE FILL (P3. IENTRY)
20010C: COMPUTES AVERAGE AIR PRESSURE IN ROOM DUE TO BLAST HAVE
20020C: INCIDENT HEAD-ON UPON FRONT WALL.
20030C
20050 CAMMAY KINCALDTYPE, KRF, KRAND, TIME, II. YC 100), OT. JU, YU, YFAIL,
        ZL 9, 88, HB, FPC, FDY, I CASE, 45(4), APS(4), U(4), DP(4), FDC,
20052+
         EC. ES. GAREA. PAREA. ZMASS. ZKLM. VLI. VLZ.
20055+
         MEMB, ASCS, VCL. ODL SLAB, (COMP, HS, BS, VSLABS, NAMEF(2), (LBAD,
20056+
         W. PO. CO. LOC. S. ZLEN. CD. PSO. PDO. PR. PERT. PC. TC. TO. DELAY.
20057+ TT(80,2), PP(80,2), REAC(80,2), INDEX(2), BR(2),
20056+
         NWIN, RMAA, V3, L1, AA(8.2), NN(8), AFRANT, ASIDE, G. 62, 63, 64, PP2, DT
SOODO FAULCAL FIFESTS
20095C
20100 GOTACIO.13.113.15YTRY
20110 10 RETURN
20310C
20320 13 P30=P8
20330 TT=0.$ T0=0.
20340 RH030=RH08
20350 L2= . FALSE . $ L3= . FALSE .
```

```
20360 RETURN
20370C
20390 11 IF(L1) GTT 52
20345 IF(L2.A.L3)(3)T3 9
20390 52 90T=(TIME-T))*0.5
20395 IST3P=2
20400 53 IF(DDT+LT+DT)GJT) 51
20410 50 DDT=9.5*UDT
20415 ISTAP=2*ISTAP
20420 GA TA 53
20430 AL CANTINUE
20440 DA 99 I=1*ISTAP
20450 TT=T9+1*DDT
20450 IF(TT-GT-TO)G3 T) 99
20470 DM=0. $ WW=0. 5 NW=0
20480 07 500 4=1, NWIN
20490 M=NN(4) $ DLY=AA(4,2)+0.000001
20500 IF(DLY-GE-TT) 63 T3 500
20510 GITA(15, 16, 16), 4
20520 15 CDF=1.0
20530 IF(TT-TC)20,20,21
20540 20 P11=(TC-TT)*(PR-PC)/TC+PC
20550 P11=P11+P3
20560 GT TT 30
20570 16 CDF=-0.4
20600 21 R=TT/TO 5 RR=1.-R
20610 PD=P03*RR*RR*E(P(-2.*R)
20620 PS=PS7*RR*EXP(-R)
20630 P11=PS+CDF*PD
20640 P11=P11+P8
20650 30 RH31=RH33*((P11/P3)**G2)
20460 IF(P11-P31)36,36,37
20670 36 ISIGN=-1
20680 L2=. TRUE.
20770 303 P2=P11
20780 RH32=((P2/P33)**G2)*RH33%
20790 K=P38/RH839
20800 62 T3 38
20810 37 JSIGN=+1
20820 306 P2=PP2+P11
20930 RH32=((P2/P11)**G2)*RH31
20940 X=P11/RH71
20950 38 U22=G4*(X-P2/RH72)*32**144*
20860 [F(122)40,39,39
20870 40 PRINT, *1122 NEGATI VE++1122
20880 STOP
20890 39 IJ2=SORT(U22)=JSEGN
20900 DD4=U28H328A(4,1)+DDT
20910 DM=DM+0DM
20920 WW= WW+P11+DDM/(G3+R431)
20925C
20930 500 CONTINUE
20940 P39=P30+(G-1+)+WW/V3
20950 RH030=RH030+D4/V3
20960 99 C8NTINUE
20970 T0*TT
20980 P3*P30*P8
20982 IF(TIME.GE.TC)L3=.TRUE.
20983 RETURN
20984 9 R=TIME/TO $ RR=1.0-R
20995 PD=PD3+RQ+RQ+EXP(-2+0+9)
20986 PS=PS0#RR#EXP(-R)
20987 P3=PS+PD#(AFR9NT-0.4#ASIDE)
20990 999 RETURN
30000 SHRABUTINE RESIST (TENTRY)
30010C: THIS SUBHAUTINE DETERMINES THE RESISTANCE FUNCTION, 30020C: TRANSPORMATION FACTORS, AND REACTION COEFFICIENTS! AND 30030C: SUPPLIES THE REACTION VALUES FOR SPECIFIC DEFLECTIONS
30040C
30050 CAMMON KINCALDTYPE, KRF, KRAND, TIME, I, Y(100), Q, QU, YU, YFAIL,
30052+
           2L9,89,49,FPC,FDY, 1CASE, AS(4), APS(4), D(4), DP(4), FDC,
30054+
           EC, ES, JAREA, PAREA, ZMASS, ZKLM, VL1, VL2,
30055+
           MEMA-ASCS. VCL. ODL SLAB, KCOMP, HS. BS. NSLABS. NAMEF(2). KLOAG.
```

```
PROGRAM RCBEAM (CONTINUED)

30056* M.P8-C09L8G.S.ZLEV.CD.PS3.PD3.PR.PEXT.PC.TC.TO.DELAY,
30057* TTCR0.2).PREGO.2).REACCR0.21.TUDEX(2).BR(2).RC(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2).BR(2
                                                                                              31910C
                                                                                              31930C: * DETERMINE RESISTANCE (TOTAL) CURVE FOR WALL
                                                                                              31940C: * (0 IS IN UNITS OF LB. (4 IN LB/IN., AND Y IN INCHES)
                                                                                              319500: ********************************
                                                                                              319600
                                                                                             31970C1 CASE 5
                                                                                              31980 200 01=MM/(BSS+ZLB)
                                                                                              31990 441=5C+16/(ASS+ZLB++3)
                                                                                              32000 Y1=01/KK1
                                                                                              32010 KK2=EC+1CR(1)/(ASS+7L8++3)
                                                                                              32050 205 QU=QUTERM=4U(1)/2LB
                                                                                              32060 208 YU=9U/KK2
                                                                                             32070 GOTO 260
                                                                                              32080C
                                                                                              32090C: CASES 6 AND 7
                                                                                              32100 210 31=44/(BF+7LB)
                                                                                             32110 441-EC+16/(AF+2L8++3)
                                                                                              32120 Y1=01/441
                                                                                              32130 92=MU(3)/(BF+ZLB)
                                                                                             32140 KK2=EC+1CR(3)/(AF+7LB++3)
                                                                                              32150 Y2=92/KK2
                                                                                              32160 KK3=EC+1CR(3)/(ASS+7LB++3)
                                                                                              32200 215 QUEQUTERMONUC1)/ZLB
                                                                                             32210 220 YU=Y2+(9U-92)/K43
                                                                                              38550 580 CSALIANE
                                                                                             32260 OFAIL=QU
                                                                                              322500
                                                                                             32290C: CHECK FOR TYPE OF FAILURE - LIGHTLY REINFORCED OR CONVENTIONAL 32300 IF(MU(1)-LT-1-5-MM)GATO 288
                                                                                             32310C
                                                                                             32320C: CONVENTIONAL TYPE FAILURE
32322 IF(ICASE-EQ-1-OR-ICASE-EQ-5)GDTD 272
                                                                                              32324 YE=Y2+YU+(1.0-92/9U)
                                                                                              32326 00T9 273
                                                                                              32328 272 YE=YU
                                                                                              32330 273 YFAIL=YE+0.1/(AS(1)/(RB+D(1)))
                                                                                             32340C: DUCTILITY FACTOR MUST BE 4# 30
                                                                                             32350 IF(YFAIL-GT-30-0*YE)YFAIL-30-0*/E
```

The Same Same

NO NEGOTIAN PROPERTY OF THE PR

```
32390C: LIGHTLY REINFARCED TYPE OF FAILURE
32400C: THE FULLIWING EXPRESSION IS BASED ON A STEEL ELINGATION OF 204 32410 298 GCTEF=30+ 32412 PRINT 605
32414 75AD, VIRAR
32429 'JPH= JCHEF+502T(FUC)
32430 A9AR=3.14159*(NAAAN16.)442
32440 290 YFAIL=508T(().244844.FDY/4PH+7LB/2.)442-(/LB/2.)442)
32460C
32470C TENSILE MEMBRANE REMANITE
32480 300 RF(4EMB-NE-1) GOTG 285
32630 312 4T=8-0*1-5
32635 [S#ASCS*FDY
726AD 314 YT= 21147L97.4T+TS)
32642 GT=9U
32644 IF(YT.LE.YFAIL)@TJ 316
32646 YT=YFAIL
32645 9T=YT=<T=TS/7LB
32650 316 IFCYFAIL-LT-0-15+ZLB)YFAIL=0-15+ZLB
32660 3FAIL=0.1544T+TS
12670C ADTUST LIAD-DEFLECTION CU-VE FOR HEAM DEAD LOAD
32480 245 10L=70LSL48+150.7448+3847L9/1708.0
32700 IF(70L.G[.01)G1T) 29?
32710 YOL= >DL/<<1
32712 5373 295
32713 292 5373(293,294,294),[CASSA
32714 293 YOL = Y1+(3DL-01)+(YU-Y1)/(QU-01)
32715 241 IFC702-4-T-2020 G1T1 295
32716 PRINT, 0010 =0,000, 0 011 =0,00 5 STOP
32717 294 YOU=Y1+(004-01)+(72-Y1)/(92-31)
32714 [F(00L+LT+02)G)[1 295
32719 YOL=Y2+(30L-02)*(YU-Y2)/(9U-92) $ G3T3 221
32720 295 Y1=Y1-YOL$ Y2=Y2-YOL$ YU-YU-YOL$ YT=YT-YOL$ YFAIL=YFAIL-YOL
32725 31=31-30L$ 02=02-30L$ 3U=3U-3OL$ 0T=QT-QOL$ QFAIL-QFAIL-YOL
32730 IF (KRAND+NE-1) PRINT 673, 70L, YOL
327590
32760C: 3 ITPUT LIAD-OFFLECTION CHRVE
32770 IF(KR4N0.F7-11631) 335
32790 PRINT 650
32793 IFCTUASE-ED-5367TJ 327
32793 IFCTUASE-ED-5367TJ 327
32903 PRINT 660-01-71-72-72
12510 GTT# 330
32320 320 PRINT 669.21.Y1
32430 330 (FC4549-EQ-1) GIT1 332
32840 PRINT 660. QU. YU. OFAIL, YFAIL
32850 6173 335
32955 332 IF(QT-NE-9U)G3T9 333
32860 PRINT 660, DU, YU, OT, YT, OFAIL, YFAIL
32862 (919 335
32864 333 PRINT 660-9U-YU-QU-YT-QT-YT-QFAIL-YFAIL
32870 335 C3NTINUE
328400
32890 CALL TRANSCICASE4, ZKLM, ZKLMSE, ZKLMPE, ZKLMP, VLIS, VL2S, VLIF,
32900+ VL2F, VL1P, VL2P)
32920 3SHRL=VCL+D(1)+R9
32970 340 IFCGRAND. NS. 13PRINT 695. 254RL
32990 RETURN
333000
33020C: • ENTRY 3: DETERMINE THE RESISTANCE (PER UNIT AREA) •
33030C: *
                     OF THE WALL AS A FUNCTION OF YOLD
3304061 ********************************
43050C
33060 500 IF(Y(I)+GE-YFAIL)G3T3 560
33070 IF(Y(I)+GT-YU)G3T3 340
33080 G)T3(501,520,520,520,501,520,520),1CASE
33090 501 CANTINUS
33100C
33110C: ELASTIC RANGE -- CASES 1 AND 5
33120 KLU4=KKL4SE
33130 WL1=VL1S $ VL2=VL2S
33150 [F(Y(1)+GT+Y1)G3T3 510
```

White the state of the same of the same of

The second secon

1000年代後年

```
33170C: UNCRACKED PORTION -- ALL CASES
33180 505 0=Y(1)*441
33190 RETURN
33200C
33210C: CRACKED PARTION -- CASES 1 AND 5
33220 510 0=91+(Y(I)-Y1)+(3U-31)/(YU-Y1)
33230 RETURN
33240C
33250 520 IF(Y(I).GT.Y2)G3T3 530
33260C
33270C: ELASTIC RANGE -- CASES 2.3.4.6.7
33280 ZKLM=ZKLMFF
33290 VL1=VL1F $ VL2=VL2F
33310 IF(Y(I).LT.YI) GJT3 505
333150: CRACKED PORTION -- CASES 2.3.4.6.7
33320 Q=Q1+(Y(1)-Y1)+(Q2-Q1)/(Y2-Y1)
33325 RETURN
33330C
33340C: ELASTO-PLASTIC RANGE -- CASES 2, 3, 4, 6, 7
33350 530 7KL4= CKL45E
33360 VL1=VL1S $ VL.2=VL2S
33380 9=92+4-3+(1(1)-72)
33390 RETURN
33400C
33410C: PLASTIC RANGE -- ALL CASES
33420 540 ZKLM=ZKLMP
33430 VL1=VL1P $ VL2=VL2P
33450 IF(Y(I: GT-YT) G7T9 550
33460 0=90
33470 RETURN
33480C
33490C
        TENSILE MEMBRANE RANGE -- ALL CASES
33510 550 990T+(Y(I)-YT)+(QFAIL-9T)/(YFAIL-YT)
33510 RETURN
33520C
33530C: WALL CALLAPSED - NA RESISTANCE (TA AVAID NIMERICAL DIFFICULTIEES
33540C: FOR CERTAIN CASES SET RESISTANCE EQUAL TO VERY SMALL VALUE)
33550 560 2=1E-10
33560 RETURN
33570C
33595 605 FORMAT(/*INPUT BAR NUMBER OF REINFORCEMENT*.+)
33683 633 FØRMAT(/+QDL =+,F10.2,+ LB
                                             YDL =*, F8.4, + [4.4)
33700 650 F3RMAT(//#L3AD-DEFLECTION CURVE*,/,4x,+3T (LB)
33710 660 FØRMAT(F10-2-F12-4)
33760 695 FORMAT(/*0SHRL =*,F11-2,* LB*)
33850 END
35000 SCHRAUTINE MAMENT(FDC. FDY. ES. N. PV. B. AS. APS. D. DP. MU. ICR. IC.
35001+
                           KCAMPAHSABP)
35010C THIS SURROUTINE DETERMINES THE ULTIMATE MOMENT CAPACITY AND 35020C CHACKED MOMENT OF INERTIA FOR REQUIRED SECTIONS
35040 REAL <1.42.43.4UD. N. IC. 1CTTT. MU(4). ICR(4).AS(4).APS(4).D(4).OP(4)
35050C
35060C: DETERMINE VALUES OF CONCRETE PARAMETERS 35070 45 41=0.94-FDC/26E3
35090 42=0.50-FDC/RE4
35090 43=(3900.0+0.35*FDC)/(3E3+0.R2*FDC-F9C*FDC/26E3)
35100 EPSC=0.004-FDC/65E5
35150C: ***********************
35160C: * DETERMINE ULTIMATE MAMENT CAPACITY AND CRACKED * 35170C: * MAMENT OF INERTIA FOR REQUIRED SECTIONS *
35180C: *****
35190C
35200 II=0$ ICT#T=0
35210 D9 170 I=1.4
35220 IF(AS(I).EQ.0)GITJ 170
35230 11=11+1
35240C: ALL PROPERTIES ARE COMPUTED FOR A WIDTH B
35250 TENS=AS(I)*FDY*PV
35260 IF(APS(I)*LE*0)@T0 150
35270C
35280C: WALL HAS COMPRESSION REINFORCEMENT
35290 C=41+43+FDC+9+DP(1)
35300 TERM1=0.50(TENS/APS(1)+ES0EPSC)
35310 TERM2=ES*EPSC*(TENS+C)/4PS(1)
```

```
35320C: DETERMINE LICATION OF NEUTRAL AXIS
35330 IF(TENS-LF-C) GTT 140
35340C
35350C: < 410 > 91
35360 FPS=TERM1+43*FDC/2+0-534T((TERM1+43*FDC/2+0)**2
35370+ -(TER42+ES*EPSC*(3*FOC))
35380C: F'S MUST HE <= FDY
35390 IF(FPS-LT-FDY) 53T3 130
35400 FPS=FDY
35410 130 TPS=APS(I)*(FPS-43*F0C)
35420 <!D=(TENS-TPS)/(<1*43*FDC*3)
35430 MU(1)=(TENS-TPS)*(O(1)-42*4UD)*TPS*(O(1)-DP(1))
35440 IC=([)=9*(!|D**3/3.0+V*45([)*(D([)-4]D)**2
35450+
       +(V-1)*APS([)*((I)0-0P([))**2
35460 GJT0 152
35470C
35490C: (1)D < D'
35490 140 FPS=-TERM1+SORT(TERM1++2-TERM2)
355000: F'S MUST RE <= FDY
35510 [F(FPS-LT-FDY) G3T3 145
35520 FP5=FDY
35530 145 TERM3=TENS+APS(1)*FPS
35540 KHD=TERM3/(K1*K3*FDC*B)
35990 Mg(I)=TERM3*(D(I)-{2*49D)-APS(I)*FPS*(D(I)-DP(I))
35 D ICRCID=94(UD#+3/3+V#4<C(1)+CDCD+C+UD++2+V#4P$(I)+(DQCD+C+C+UD)++2
35570 GUTA 152
35580C
35590C: WALL HAS NO COMPRESSION REINFORCEMENT
35600 150 KUD=TENS/(K1*K3*FDC*B)
35610 MUCT)=TENS+(D(1)---24(UD)
~5620 | ICR(1)=9*KUDC+3/3+0+V*AS(1)*(0(1)-KHD)**2
35630C
35640 '52 IF((C3MP+E3+0) 9313 155
35650 IF(1+E0+3) 0313 170
35660 IF(KUD-LT-HS) GOTS 170
35690C * TEE REAM -- NEUTRAL AXIS BUTSIDE FLANGE * 35690C (USE EDULVALENT RECTANGULAR STRESS BLOCK)
35700 ASF=0.85*FDC*(8-9P)*45/FDY
35710 (JD=(AS(I)-ASF)+FDY/(0.95+FDC+RP)
35720 4U(1)=45F+FDY+(D(1)-0.5+45)+(A5(1)-A5F)+FDY+(9(1)-0.5+4UD)
35730 ICR(I)=8P*KIID**3/3.0+(9-8P)*45**3/12-0+45*(8-8P)*(410-0-5*45)**2
35740+
              **** (O(1)-(1)O) **2
35750 155 ICTOT=ICTOT+ICR(I)
35760 170 CANTINUE
35770C
35780C: DETERMINE AVERAGE CRACKS
35790 175 IC=1CT0T/11
35800 RETURN
                                         FINT OF INERTIA
35RIO END
40000 SUBREUTINE COEF (ICASE4, ASS, BSS, AF, BF, ICEN, ISUP)
40010C
        THIS SUBROUTINE DETERMINES DEFLECTION AND MOMENT COEFFICIENTS FOR TEE BEAMS WITH VARIABLE MOMENT OF INERTIA
40020C
40030C
40040C
40050 REAL ICEN.ISIP
40060C: CASE S. BYE-WAY STAPLY SUPPORTED WALL
40070
           ASS=5+0/344+0
40080
             BSS=0-125
40090 RI=ISUP/ICEN
            63 13 (270.69.70).1 CASF4
40100
40110C
         CASE 6. ANE-WAY FIXED END WALL
40120C:
40130 60 9F=(+00953++03213+RI)/(+211++289+RI)
40140 AF=+00132++01169+RI-9F+(+0223++1023+RI)
40150 RETURN
40160C
          CASE 7. ANE-WAY PRAPPED CANTILEVER WALL
401 70C:
40180 70 8F=(.0109+.0308+RI)/(.1926+.1407+RI)
A0190 AF=-.00439-.00342*RI+BF*(.08333*.02043*RI)
40200 270 RETURN
40210
            EAD
SUBROUTINE THANS (ICASE4, ZKLM, ZKLMSE, ZKLMFE, ZKLMP, VLIS, VL2S,
50010+
            VLIF. VLSF, VLIP, VLSP)
```

Salter Sa

```
500200
        THIS SUBROUTINE DETERMINES TRANSFORMATION FACTORS AND
50040C
         DYNAMIC REACTION CREFFICIENTS FOR ONE-WAY REAMS
500500
50060C
        ALL CASES
50070 ZKLMSE=0.79
50080 74LMP=0.66
5 J090 VL15=0-107
50100 VL25=0.393
50110 VL1P=0-125
50120 W.2P=0.375
50130 GT3(300,310,320),ICASE4
501400
501502 CASE 5 50160 300 74LM=24LMSE
50: 70 VL1=VL1S
50180 VL2=VL25
50190 RETURN
50200C
50210C
        CASE 6
50220 310 24LMFE=0.77
59230 VL1F=0.136
50240 VL2F=0.364
50250 GOTO 330
50260C
50270C CASE 7
50280 320 ZKLMFE=0.78
50290 VL1F=0-165
50300 VL2F=0-459
50310 330 ZKL4=ZKLMFE
50320 VL1=VL1F
50330 VL2=VL2F
50340 RETURN
50350 END
70000
            SUBROUTINE RANDOM (TENTRY)
70010C THIS SURRAUTINE INPUTS MEAN AND STANDARD DEVIATIONS FOR RANDOM
70020C VARIABLESI GEVERATES RANDAM VALUESI AND CONTROLS REQUIRED 70030C NUMBER OF CASES TO BE RUNI AND SUTPUTS FINAL RESULTS AND SUMMARY
70040C
70050 COMMON KINC, LOTYPE, KRF, KRAND, TIME, II, Y(100), QT, QU, YU, YFAIL,
         ZLB, BB, HB, FPC, FDY, I CASE, AS(-), APS(4), D(4), DP(4), FUC,
         EC. ES. GAREA, PAREA, TMACS, TKLM, VL1, VL2,
70055+
         MEMB. ASCS. VCL. ODLSLAP. KC&MP. HS. BS. NSLARS. NAMEF(2). KLJAD.
70056+
         W. Pa. Ca. Lac. S. ?LEV. CO. PSa. PDa. PR. PEXT. PC. TC. TO. DELAY.
700574
         TT(80.2), PP(80.2), REAC(80.2), INDEX(2), BR(2),
         NWIN, RHOO, VOLLI, AA(G, 2), NN(R), AFRONT, ASIDE, G, G2, G3, G4, PP2, DT COMMON /RAND/ TIMEC
70058+
70080
            DIMENSION CHI25(7), CHI975(7), TDIST(7)
70090
70100C
70110C VALUES FOR 97.5% (F=19.24.29.34.39.44.49)
70120
            DATA CHI25/ . 4039 . . 5167 . . 5533 . . 5825 . . 6065 . . 6267 . . 6440/
70130
            94TA C41975/1.7295.1.6402.1.5766.1.5284.1.4903.1.4591.1.4331/
70140
701500
            DATA TDIST/2-093, 2-064, 2-045, 2-032, 2-022, 2-016, 2-010/
70160
            G2 T3 ( 5. 50, 70 ) . I ENTRY
70170
          5 XDUMMY=XN9R41(-1.0.0.0.1.0)
TOTALITE HANDY NUMBER GENERATTE
70190
            PRINTA / . . INPIT NRAYD.
70200
            READ, VRAVO
70210
            D3 47 [=1,48440
70220
            XDU44Y=X43441(0.0,0.0,1.0)
         47 CONTINUE
70230
            INDEX=08 SPS3=09 SSPS3=0
70240
70250
            104504=20
70260C
        INPUT MEAN AND STANDARD DEVIATION FOR RANDOM VARIABLES
70270C
            IF(LJC.E)-2)6111 30
70275
70290
            PRINT 97
70290
            READ, SHEAN, SSD
7041CC REINFRACED CANCRETE WALLS
70420 30 PRINT 86
            READ, FOYMEAN, FOYSU
70439
            IF(L3C.E9.1)PR'NT 24
70440
            IFCLBC. NE. 1)PRINT 95
```

。40世纪节子。

```
RETHRY
7:1457
70460C
7747UC
               GENERATE RAYDIM VALUES
             50 FOT= (N3RM1(0.0.FOYMEAN. > )YSU)
                      IF(F0Y-LE-0)G3T3 50
79540
70595 [F(L)3C.50.2.32.546A4.50.0) G111 65
70590 60 SXXV3R41(0.0.345A4.450)
                      1F(S+LE+0)G3F# 60
70600
70610 65 INDEC=INDEC+1
                      450139
70620
 10630C SUM VALUES OF PSY AND PERMED FOR USE IN STATISTICAL ANALYSIS
70640
             79 SPS3=SPS3+PS3
70650
                      SSPS## SSPS#+PS7*PS1
70640C
 70670C TUTPUT FINAL RESULTS
70730 76 IFCLSC. ED-LIPPINT 42. FDY. Y. PSJ. TIMEC
                      IFCLOC.NE. IPPRINT POPPOYINGS. TIMES
 70735
             90 IF(INDEX+LT+1CHECK) RETURN
 70750C
 70760C DETERMENE MEAN, STANDARD DEVIATION, AND STANDARD EPROR FOR FAC
                      X3( V 1 = 6 V 5
70779
                      ZYEAN=SPSS/ZNA
70780
                       SD=SOR((CSSPS2-4ND+24FAN+24FAN)/743)
70790
                       STOER9-50/(509T(2N3-1))
 73809
 TURIOC CHECK IF MAXIM M OF 50 PSO SAMPLES DOTAINED
 70920
                      IFCI (DEX. EQ. SO) GIT1 62
 TORBOC CHECK IF 95% CONFIDENCE INTERVAL FOR MEAN POR VALUE IS
                      IF(STUERR*TOIST(EINDEX-15)/5)/ZMEAN.GT.O.10) SETA AL
70840
 TORSOC
 708 STEP STORY OF THE PROPERTY OF THE PROPERTY
 70970C 95% CAMPIDENCE INTERVAL FUR STANDARD DEVIATION
70890C PROBABILITY VALUE AND ITS 95% CONFIDENCE INTERVAL UPPER LIMIT
                62 SDU=SD/(SGRT(CH125((140Ex-15)/5)))
 70390
70900C CHECK IF MAXIMUM 3F 50 PS3 SAMPLES 25TAINED
70910 IF(INDEX-E2-50) G313 53
70920C CHECK IF UPPER VALUE 3F 95% CONFIDENCE INTERVAL FOR STANDARD
70930C DEVIATION IS WITHIN 0-10**FAN 3F THE STANDARD DEVIATION
                       IF(((SQU-ND)/24EAN).GT-0-1016373 61
 70940
 709 SOC
70960C 952 CONFIDENCE INTERVAL IS WITHIN 101 FOR MOTH MEAN AND 901 70970C PROMABILITY VALUE -- THEREFORE SUFFICIENT SAMPLES OMTAINED
 TOPROC DETERMINE 95% CONFIDENCE INTERVALS FOR MEAN, STANDARD DEVIATION
 70990.
 71000C AND 10% AND 90% PRABABILITY VALUES
                 S3 THEAVE=THEAN-STOERR&TDIST((14064-15)/5)
 71010
 71020
                       ZMEANU-ZMEAN+STDERR+TDLST((LNDEX-15)/5)
 71030
                       SPL=SD/(SORT(CH1975((INDEX-15)/5)))
 71040
                       D10=24EAV-1-242*SD
 71050
                      P10L=74EAN-1-292450U
                       P10U=74EAN-1-282450L
 71060
                       C2*SFS+1+VA3M5=089
 71070
                       P90L=74EAV+1-282+50L
 71050
                       02*$P$+1+PARP*$P$
 71090
                       UG2-252-1+VA3#3=U099
 71100
 71110
                       P909=74EAN+ (+242#500
 71120C
 71130C JUTPUT STATISTICAL PARAMETERS OF INCIPIENT COLLAPSE PRESSURE
                     PRINT 100, EMEAN, EMEANL, EMEANU, SO, SOL, SOU, PIO, PIM., PIOU,
 71140
 71150+
                           P90. P90L . P90'I
 71160
                       PRINT 105, INDEX, STREAM
 71170
                       G7 [7 999
 71 183C
 71196C 954 CONFIDENCE INTERVAL IS NOT WITHIN 10% FOR ROTH MEAN AND 90
 712008
 712100 VALUES -- THEREFIRE THTAIN 5 ADDITIONAL FAMPLES
                 61 ICHECK=ICHECK+5
 71220
 71230
 71240C
 71270 86 FRRMATC/-(LAP)T MEAN AND STANDARD DEVIATION FOR FDY-, +)
71280 87 FERMATC/-(LAP)T MEAN AND STANDARD DEVIATION FOR Se-+)
 71290
             99 F3RMAT(F9.2.F10.2.F14.3)
               92 F3R4AT(F9-1,F11-2,F10-2,F14-3)
 71310
               95 FAUMATO///, 54, 4FDY+, 7K. +PSJ+, 6X. +CBLLAPSE TIME+)
  7134C
                96 FARMAT(///, SX. #FDYez PX. #S*, 4X. *PSZ*, 6X. *GZLLAPSE TIME*)
  71350
```

30 ml x 2 ml 4 x 1 ml 2 ml

PROGRAM RCBEAM (CONCLUDED)

The solution of the solution o

The content of the co

SO ASSESSMENT CALCULATES AN

the state of the s

STBEAM

Steel Support Beam

PROGRAM STBEAM

```
00100 PRAGRAN STREAMICENPUT, SHITPHE, TAPEL)
00105 CALL RETROTHSTREAMS, THSTREAMS)
00110C * THIS PARTION OF THE PRAGRAM INPUTS THE REGULARD ELEMENT
DOITSC: AND LOAD DATA AND INITIALIZES CERTAIN PARAMETERS
OC: 50 COMMON KINCILUTYPE: KREIKRANDITIME: LIYCTOOIIOTIOIIIYIII YEALLI
00,52+
         ZLB, Ha, BFL G, Trl G, Tw. FDYS, I CASE, KPLATE, KCAMP, NP, BP, ES,
         HPC, 45, FPC, FOC, EC, 85, FDY 4, A5, D, APS, DP, QAREA, PAREA, Z4ASS, Z4L4, VL 1, VL 2, VSLAAS, NAMEF(2), 4L 3AD, 9OL SLAR,
00154+
00155+
         W. PO. CO.LOC. S. ZLEY. CO. PSJ. POJ. PR. PEXT. PC. TC. TO. DELAY.
00156+
         TT(80,2), PP(80,2), REAC(80,2), INDEX(2), 9R(2),
00159¥
         VHI V. RH 19. V3.L1. AA(8.2), VV(8), AFRENT, ASIDE, G. G2. G3. G4. PPR. DT
00160 LOGICAL LI
00165C
901700 * READ TITLE AND CONTROL PARAMETERS
J0172 PRINT 67
00174 READ 68, TITLE
00176 PRINT 720
00178 READ. NSLABS: KL3AD
00190 PAREA=0 $ 00LSLA9=0
00182 IF(<L3AD.EQ.Q) G3T3 40
00184C
00196C: INPUT SLAB REACTION DATA FILE DATA
00188 PRINT 725
00190 DO 39 J=1. NSLABS
00192 PRINT 735, 1
00194 READ, NAMEF(J), ISIDE
00196 CALL PFIJR(3HRET, 1, NAMEF(J))
00198 IF(ISIDE-EQ-1)READ(1,)SAREA, DUM, HS
00200 IF(ISIDE.EQ.2)READ(1,) DUA, SAREA, HS
00200 510 INDEX(J)=1
00204 READ(1,) NPOINT
00206 IF(ISIDE-E0-2) G3T3 520
00208 515 READ(1,)(TT(1),)),PP(),)),REAC(),)),DIM,JJ=1,NP3INY)
00210 GRTR 525
00212 520 READ(1,)(TT(1],1),PP(1], J),DiM,REAC(1], J), J=1,NP3[NT)
00214 525 BR(1)=(REAC(2, 1)-REAC(1,J))/(TT(2,J)-TT(1, 1))
00216 9P=(PP(2,1)-PP(1,1))/(TT(2,1)-TT(1,1))
1 GRIWAR RISOO
00220 CALL DR3P1(1)
00221 20LSLAB=20LSLAB+150+0* SAREA*HS/1729+0
00222 39 PAREA=PAREA+SAREA
00224 KINC=0 5 LDTYFE=5 $ KRF=0 $ KRANU=0
00226 G3T3 45
002230
00230C INPUT TRIBUTARY SLAB DATA
00238 40 PRINT 730
00234 D0 42 J=1. NSLABS
00236 PRINT 735, J
00236 READ, SAREA, HS
00240 ODLSLAB=QDLSLAB+150.0*SAREA*\5/12.0
00242 42 PAREA=PAREA+SAREA+144.0
00244C
00246 PRINT 85
00248 READ, KINC, LDTYPE, KRE, KRAND
00250 45 CONTINUE
00252 DELAY=0
JO254 67 FORMAT(/#INPUT TITLE*,+)
00256 68 F3RMAT(A59)
00258 85 FORMAT(/*INPUT KING,LDTYPS,KRF,KRAND(1=RAND3M)*,+)
00260 720 F3RMAT(/*INPUT NUMBER 3F SLARS SUPPRITED BY 944+, AND IF +, 00262+ *SLAB REACTIONS*/*ARE TO BE CALCILATED (0) JR READ FROM +,
00264+
           *DATA FILE (1)***)
00266 725 FORMATC/+INPUT REACTION DATA FILE NAME AND SIDE +.
           *(1=SHORT.2=LONG)+)
00270 730 FORMATI/*INPUT CONTRIBUTARY AREA (SO FT) AND THICKNESS (IN-)*) 00272 735 FORMAT(6%*FOR SLAB NO-*,12,+)
00274C
00570C INPIJE LOAD PARAMETERS
00571 IF(LDTYPE-E9-5) GOTO 20
00570C
00575C LECATION 1. FRANT FACE LOADING (USED IN ROOM-FILLING PROCEDURE)
00590 IF(KL3AD-EQ-1) 03T7 25
00585 100 W=1000+0 $ P3=14+7 $ CR=1120+0
00590 IF(KRF-NE-1) (017 102
```

```
00595 LaC-1
00600 IF(KRAND.ET.1) 977 106
00405 PRINT 400
00610 READ.S
00615 GITI 105
00620C LECATION 2. TEP FACE LEADING
00652 105 CD=0 $ F3C=5
00630 3LEN=3L9/12.0
00535 105 IFCKING--0-1268T3 :06
30640 PRINT 610
00645 READ PS&
00650 P4=2.0+P50+(7.0+P3+4.54P50)/(7.0+P3+P53)
00655 600 F2RMAT(/*INPUT S*++)
00560 610 F2RMAT(/*INPUT PS3**+)
00670C * INPUT REEM-FILLING PARAMETERS *
00675 106 1F(4RF.E0.0) GJTJ 20
00690 10 PRINT 700
00695 RH33=0.076 $ L1=.FALSE.
00690 UELAY=1E10
00693 READ, NWIN, V3
00700 AT=05 AFRONT+05 ASIDE=0
00705 99 18 I=1, NWIN
00710 PRINT 710,I
00715 READ, AACI, 1), NNC(1), AACI, 2)
00720 AA(1,2)=AA(1,2)/1000.0
00725 AT=AT+AA(I,1)
00739 M=NN(1)$ G3T9(12,14,14), M
00735 12 AFR3NT=AFR3NT+AA(1,1)
00740 G8T8 18
00745 14 ASIDE=ASIDE+AA(I+1)
00750 18 IF(AA(I+2)+LT-DELAY)DELAY=AA(I+2)
00755 AFRANT=AFRANT/ATS ASIDE=4SIDE/AT
00760 700 FORMAT(/*INPUT NWIN AND RADM VALUME (CE)***)
00765 710 FORMAT(/*INPUT AREA (SO FT)*L3CATION CODE & DELAY(MSEC)*
           * F32 WI 403W*+12++)
00775 G=1.4 $ G2=1./G $ G3=1.-G2 $ G4=2./G3 $ G5=G+1.
00780 PP2=-1912
00785 C=S3RT(G+P3+32++144+/RH73)
00790 TAU=2.*(V3**(1./3.))/C
003000
DOSOS 20 CANTINIE
COMPAND STATEMENT SE OIROO
00415 99 STAP
01000 SEGMENT STREAMP(INPHT. THIPHT. TAPEL)
         THIS SEGMENT CALCILLATES THE RESISTANCE FUNCTION AND
         LETTER AL SECTIONOS SHENOVALE CONTRACTOR SALVES
010300
01050 COMMON KINGALDTYPEAKAS KHANDATIMEALAY(100) OTA DIRYIRYERIKA
         ZL R. HR. ARL G. TFL G. TW. FDYS. I CASE. (PLATE. (C) 4P. AP. AP. ES.
APC. HS. FPC. FDC. RS. FDYR. AS. D. APS. DF. DAREA. PAREA. Z 44SS.
01052+
01054+
01055+
         TKLM, VLI, VLZ, NSLABS, NAMEF(2), KLJAD, QULSLAB,
          # Par Carlaces - ILEN. CD. PSA. POB. PF. PEXT. PC. TC. TO, DELAY.
01057+
         TT(80,2),PP(80,2),REAC(80,2),[NDE((2),84(2),
01059+
         141 N. RH33. V3.L1. AA(9.2), NN(H), AFP34T, AS(D5. G. G2. G3. G4. PP2. DT
01079 C3443N /RAND/ TIMEC
01030 014545134 AC160>>VC100>>TC100>>VSC100>>VLC109>>PNC1062
011000
01240
             CALL RESIST(1)
01250 IFCKING-NE-1-84-LOTYPE-ED-5) CALL FREE(1)
01260 14
            IFCKRAND+NE-1) GTTO 35
01270
             CALL FRACE(4)
01240
             CALL RANDIM(1)
01290 34
             CALL RANDAM(S)
             CALL RESIST(3)
01300 35
91310C
DIBROC: MINIMIM, MAKIMUM, AND STARTING VOLUES ARE DETERMINED FOR CASES
01330C: WHERE THE LIAN CAUSING INCIPIENT CILLAPSE IS TO BE FOUND
01349 13
            IF(<140.30-0)6713 23
01350 PF=4.0
01369
              PENAKED
              PF41 N=PF/2.0
01370
```

A Secretary of the second state of the

```
01390
            G3 T3 20
             PF=(PF4[N+PF4AX)/2.0
01390 16
01490 20
            CALL FORCE(2)
01410 23
            IF(4RF.EQ.0)G3T3 24
01420
            CALL FILL (PINT, 2)
014300
          INITIALIZE VALUES FOR BETA METHOD (BETA=1/6) AND COMPUTE VALUES
0144001
          FOR FIRST TIME INTERVAL ASSUMING PLEMENT INITIALLY AT REST
0145002
01460 24
01470
             TI 4E=0
01480
            V(1)=0 $ Y(1)=0
01490
             DEL TA= 0.001
            IF(<RF.NE.1) G3T3 39
01500
            IF(TIME.GE.(DELAY-.00001)) GOTO 30
01510 27
            TIME = TIME + DEL TA
01520
            CALL FILL (PINT. 3)
01530
            CO 19 2
01540
01640 30
            CALL RESIST(2)
            A(1)=0.0 $ VS(1)=0.0 $ VL(1)=0.0
01650
01660
            T(1)=TIME
016800
01690C: PROCEDURE FOR ALL SUBCEQUENT TIME INTERVALS
01700 1
             1=1+1
01710
            IF(I-LT-101) G0T7 11
01720
            PRINT 98. TIME
01730 98 FORMAT(/*1=101: TIME =+, F6.3, *: FAILURE ASSUMED TO NOT SCCURE)
01740
            GØ TØ 6
            TIME = TIME + DEL TA
01750 11
             T(I)=TIME
01760
             A(I)=A(I-1)
01770
01775
            1F(KRF. NE. 0) 0070 10
01780
            CALL FORCECO
01790
            PV(I)=PEXT
01800
            20179 S
01880 10
            CALL FILL(PINT, 3)
01890
            PN(1)=FIVT
01910 2 IFEGLIAD. ED. O. PT=PN(I) *PAREA
01412 18 40840-48-018, abact
            98 8 355510
01:20
             Y117-Y11-10+D@_T4-V(1-10+D@_TA+D@_TA+(A(1-10/3+4(10/6+)
01930
01440
              CALL RESIST(2)
DIREC & AREWERPT-GTICERASSIZALMI
             ADD THEATEN-ACTS
01970
              ACESTANES
01980
$2-110.6134.4145.ceaper_tructerty.et.1985*. Time.pt.ut.1945.cele. ycla.411-11
            IFCABSCADELTA/CANEN+1E-16 :-LT.O-0' GPTE 9
01990
              CONTINUE
02000 8
              A(1)=AYEW-ADELTA/2.0
02010
02020 PRINT 50, TIME, PF. A(I), Y(I)
              CONTINUE
02030 9
              Y([)=Y([-1)+DELTA+V([-1)+DELTA+DELTA+(A([-1)/3+A([)/6+)
 02040
02050
              V(I)=V(I-1)+DSLTA+(A(I)+A(I-1))/2.0
02070 VL(1)=VL1+PT+VL2+0T
30905
ORIOOC: CHECK FOR MAXIMUM DEFLECTION OR FAILURE
           IF MAXIMUM DEPLECTION REACHED, WALL DID WET FAIL IFCYCID-LE-YCI-13-AND-PNCID-LE-PMCI-13-08TF 6
02110C:
 C$180
            1F(Y(1).LT.0) 6070 6
1F(Y(1).GE.YFAIL) 6010 7
 QE130
02135
             1F(TIME-DELAY-GE-0-010)DELTA-0-002
02140
             IF(TIME-DELAY.GE.0.020) DELTA=0.005
 02160
             IF(TIME-DELAY.GE.O.100)DELTA#0.010
 02170
             IF(TI4E-DELAY-GE-0-500) DELTA=0-050
 02150
            IF FAILURE DEFLECTION REACHED. ELEMENT FAILED
 021900:
 02210
 08550C
02230C: INTERVAL HALVING PROCEDURE TO DETERMINE LOAD CAUSING INCIPIENT 02240C: COLLAPSE FOR CASES WHERE DESIRED
            ELEMENT DID NOT FAIL -- SET PENIN TO PE
 02250C:
             CONTINUE
 02260 6
             IF(KINC.E2-0) GRTS 18
 02250
            PFMI Y=PF
 02290 36
 02300 IF(PFMAX-GT-0)0978 16
              PF=2.0+PF
```

... : ** * · ·

the second secon

The same of the sa

The second secon

THE STATE OF THE PERSON AND THE PERS

```
02320
              21T4 20
            ELEMENT FAILED -- SET PEACE TO PE
J2333C:
             CHALLANE
02340 7
02350
             TIMEC: CLAS
             IFCCINC. EQ. (1) (ST4 18
02370
             PFYAXEPF
02350 37
            CHECK 'S SEE IF LIAD RANGE IS WITHIN DELIGED ACCURACY IF (CAPMAN-PEMIN) PEMINOCENTIAL OF STORY 14
02390C:
02410
             IF ( KRAND . ME . 1) GTT 1 IR
             CALL RENDOM(3)
G173 34
02420
22430
02440C
02450C: JUTPUT DATA INCLUDES THE TAXIMUM DEPLECTION AND TIME OF
024600: 3CCURANCE FOR A NON-FAILING BLENCH, OR THE TIME AND VELICITY 024700: AT COLLARSE FOR A FAILING BLENCH. OPTIONAL OUTPUT IS THE
02490C: ENTIRE BEHAVIOR TIME-HISTORY.
304900
02500C: BUTPUT LOAD DATA
02516 18
              CALL FORCE(4)
0252CC
02530C: JUTPUT FINAL PESULTS
02540 IFCY(I)-LT-YFAIL)PRINT 70, Y(I), T(I)
02550 IF(+(I).GE.YFAIL)PRINT 71, F(I), V(I)
02577C
02579C CHECK TO SEE IF ENTIRE TIME-HISTORY IS DESIRED
02580 PRINT 72
02590 READ.4
              1F(4.EQ.0)G0T0 25
02680 PRINT 76. (T()).PN()).A()).V()).Y()).VL()). 1=1.1)
02690 23 PRINT 77
02710C
02740 TO FARMATI/*NJ FAILURE - MAY DEFLECTION OF*.F6.2.
C2:50+ * IN- REACHED AT*F7-3.* SEC*)
02:760 71 FORMATC/*FAILURE 3CCURRED AT*F7-3.* SEC (FINAL VELOCITY **)
          F7-2* 14-/SEC)+)
02780 72 FARMAT'/*IS TIME HISTARY DESIRED (YES=1, NA=0)*,*)
02830 76 FARMAT(/* TIME PRESSURE ACCELERATION VELOCITY *
02840+ *015FLAGEMENT VL*,*,*
02960 997
              STAP
02970
             E.VO
10000 5 IRRAVITINE FARCE(TENTRY)
10010C THIS SUBROUTINE IMPORT THE LOAD PARAMETERS AND DETERMINES
10020C THE I HAD AT A GIVEN TIME FJO THE FOLLOWING LEAD TYPES:
             1. IDEALIZED PLAST LAAD (FRANT OR SIDE FACE)
100300
10050 COMMON KINC.LDITPE.KRF.KRAND, TIME. I.Y(100). 2T.QU.YILYFAIL.
10050 COMMON KINC.LDITPE.KRF.KRAND, TIME.I.Y(100). 2T.QU.YILYFAIL.
         hpc. Hs, fpc, fdc, ec, bs, fdyr, as, d, aps, dp, garea, parea, zmass, zkly, vl1, vl2, vslab, namef(2), klad, ddlslab,
10054
1055+
          N. PO. CA.LAC. S. ZLEN. CD. PSO. PDO. PR. P. PC. TC: TO. NELAY.
10056+
12057+
          TT:80, 2), PP(80, 2), REAC(80, 2), . YDEX(2), BR(2)
10058+
          WILY, PHRA, V3, L1, 44(4, 2), NY(4), AF' JYT, ASI DE, G. C2, G3, G4, PP2, DT
10080C
10130 IF(LDTYPE-E3-5)0313 700
10135 TFCKL0AU-E0-136878 500
101400
10150 MTT (215, 200, 309, 4), LEVTRY
         CALCULATE LEAD PROPERTIES TR GIVEN PEAK PRESSURE
11030 200 MT4(205,2:0),L4C
11040 205 PS3#(PR-14.0*P5~S3RT(196.0*P3*P3+196.0*P3*PR*PR*PR)>/16.0
11050 GITA 215
11060 210 PS8=PP
11070 215 PD8=2:5+PS8+P53/(7.0+P3+P59)
11080 U=C0+SQRT(1.0+(6.0+P53)/(7.0+P3))
11092 TO=W=+0.3333/(2.2399+0.1866+PS8)
11100 GGT9(220,225),L3C
11110 220 TC=3.0+5/3
```

al magazina de grande en de la companie de la comp

```
11120 PC=PS3*(1-TC/TO)*EXP(-TG/TO)*PD3*(1-TC/TO)**2*EXP(-2*'C/TO)
11130 CD=1+0
11140 RETURN
11150 225 TARRLEN/J
11160 TA2-TA/2.0
11170 TARTO=742/TO
11180 PA=PS0*(1-TA2T0)*EXP(-TA2T0)+CD*PD9*(1-T42T0)**2*EXP(-2*TA2T0)
11190 RETURN
120000
12010C CALCULATE LJAD
12030 300 G9T8(305, 310), L9C
12040 305 TT =TIME/TO
12050 IF(TIME, GT-TC) GTT9 320
12060 P=PC+(TC-TI4E)*(PR-PC)/TC
12070 RETURN
12080 310 TTO=(TIME-TA2)/TO
12090 IF(TIME. GT. TA) 09T9 320
12100 P=PA+TIME/TA
12110 RETURN
12120 320 IF(TTO-GE-1-0) GOTA 330
12130 P*PSØ*(1-TT0)*EXP(-TT0)+UD*PDØ*(1-TT0)**2*EXP(-2*TT0)
12150 RETURN
12160 330 P=0
12170 RETHRY
13000C
13010C PRINT L34D DATA
13010 4 IF(KINC-E3-0) 9713 400
13030 PRINT 640-LDTYPE
13040 GOTO 410
13050 400 PRINT 645, LDTYPE
13060 410 CONTINUE
13070 415 GØT3(420,425),L3C
13030 420 PRINT 650
13090 GATO 430
13100 425 PRINT 655
13110 430 PRINT 660. 4. Pa. C3
13120 IFCKRAND. NE. O) RETURN
13130 G0T0(435,440),L3C
13140 435 PRINT 665, S, TC, PR
13150 GOTO 445
13160 440 PRINT 670-ZLEN-TA-PA
13170 445 PRINT 675-11-TO-CD-PS3-PD3
13180 RETURY
13510C LOAD TYPE 5 -- ARBITRARY LOAD SHAPE
13520 700 GOTO(710,720,730,740), IENTRY
13530C
13540C INPUT L3AD DATA
13550 710 PRINT 790
13560 READ, NP314T, (TT(), 1), PP(), 1), J=1, 4P314T)
13570 FACTUR=1.0
13580 IF(<1VC+E9+0) 69T3 718
13590 PMAX=PP(1,1)
13600 DØ 715 J=2, NPØINT
13610 715 IF(PP(J,1)+GT+PMAX)PMAX=PP(1,1)
13620 718 PX*PP(2,1)-PP(1,1)
13630 TX=TT(2,1)-TT(1,1)
13640 //=1
13650 RETURN
13660C
13570C
         CALCILATE MAXIMUM LIAD
13690 720 FACT39=PR/PMAX
13690 G3T8 718
13700 RETURN
137190
13720C CRLCULATE LBAD
13730 730 IFCTIME-LE-TTCIJ-1;1)) GBTB 735
13740 IJ=JJ-1
13750 PX=PP(JJ+1+1)-PP(JJ+1)
13760 TX=TT(JJ+1+1)-TT(JJ)
 13765 IF(TX-EQ-0)TX*1E-10
13770 0019 736
13780 735 P#FACT88*(PPC)1-1)*/TEMS-TT()1-12)*PY/TC)
13790 RETURY
```

وراليون مهاورات بعادتك فيتعفيهم والرا

```
200
.3410C PRINT L340 94T4
13815 740 IF(4INC+5)+1)PRINT 649+L3TYPE
13820 IF(4INC+5)+0)PRINT 645+L0TYPE
13425 PRINT 770
13430 D) 715 I=1,4P3INT
13440 P=FACT3R*PP(I,1)
13850 745 PRINT 795,TT(I,1),P
13360 RETURN
14000C
14070 640 FORMATC/*LJAD CAUSING INCIPIENT FAILURE IS AS FOLLEWS: **
             /, SY, *LJAD TYPE V MHER*, 12)
14030 645 FARMAT( / * PRIPERTIES OF LOAD ACTING ON WALL ARE AS FOLLOWS: *.
14081+ /,5%,*L340 TYPE YIMBER*,12)
14090 650 F#RMAT(8%,*(FRENT FACE)*)
14100 655 F#RMAT(5%,*(SIDE ## T#P FACE)*)
14110 660 FORMATCIOX, * H = *, F8.1, * KT P8 = *, F6.2, * PSI
                                                                                 C3 =*.
14111+
             F7-1.* FP5*)
14120 665 F7RMATCIOX, *S =*, F6.1, * FT
                                                       TC =*.F6.3.* SEC
                                                                                    PR = .
             F7.3.* PSI*)
14121+
14130 670 F9RMAT(104.+L =*,F6.1,* FT
                                                       TA =*. F6.3.* SEC
14131+
             F7.3.* PSI*)
14140 675 F7R44T(10X,*Y =*,F7.1,* FPS TO =*,F6.3,* SEC CD =
14141+ F5.1,/,9X,*PS3 =*,F7.3,* PSI PD3 =*,F7.3,* PSI*)
14150 750 FJR44T(/*INPUT NUMBER 3F LØ40 PÆINTS AND THE TIME AND *
                                                                                  CD =*.
            *PRESSURE AT EACH PAINT*)
14160 790 F7544T(/10%,4T145
14170 795 F8844T(F15-3,F12-2)
                                            PRESSURE*)
1 5000C
15002C:
            SLAB REACTION DATA
15010 500 GTT (510, 530, 540, 560), IENTRY
15020 510 RETURN
15085C
15090 530 STOP
15095C
15100 540 P=0.0
15110 D3 555 J=1.NSLA9S
15115 545 JJ=1NDEX(J)
15120 550 IF(TIME-LE-TT(JJ+1,J))GJT7 555
15125 INDEX(1)=INDEX(1)+1 $ 11=1N0EX(1)
15130 IF( 11-LT- NP 71NT) G9T7 552
15132 PRINT 690, TIME
15133 ST#P
15135 55° BR(J)=(REAC(JJ+1, J)-REAC(J1, J))/(TT(JJ+1, J)-TT(JJ, J))
15140 BP:(PF']]+1, J)-PP(]J, J))/(TT(]]+1, J)-TT(]], J))
15150 GOTT 550
15160 SSS P=P+REAC(JJ, J)+(TIME-TT(JJ, J))*98(J)
15165 P=P+2AREA*(PP(JJ, J)+(TIME-TT(JJ, J))*AP)
15170 RETURN
15190 560 PRINT 680
15190 D8 565 J=1. VSLABS
15200 565 PRINT 685 NAMEF(J)
15300 680 FORMAT( / * BEAM LOADED WITH REACTIONS FROM FILE(S): *)
 15310 685 FORMAT[10X.A7)
15315 690 FORMAT(/*END OF FILE -- BEAM HAS NOT FAILED AT*, FA. 3. * SEC*)
15320 RETURN
15330 END
20000 SUBROUTINE FILL(P3, FENTRY)
20010C: COMPUTES AVERAGE AIR PRESSURE IN ROOM DUE TO BLAST WAVE
20020C: INCIDENT HEAD-ON HORN FRONT WALL.
200300
20050 COMMON KINCALDTYPE, KRFAKRANDATINGA ITAY (100) A OTA DUAYUAYFAILA
20052+
           ZLB. 48. BFL G. FFL G. TW. FDY S. I CASE. KPLATE. KC34P. HP. BP. ES.
20054+
           HPC. HS. FPC. FDC. EC. AS. FDYR. AS. D. APS. DP. DAREA. PAREA. ZMASS.
          7 (LM, VL 1, VL 2, VS, ABS, NAMEF(2), KL JAD, JOL SLAB,
We P3, C3, L 3G, S, ZL "N, CD, P5J, PD3, PR, PCXT, PC, TC, TO, DELAY,
20055+
20056+
          (S)FR (S) x30V1 (S .0R) 3A3P (S .0R) 99 (S) . R7(S),
20057+
            NWIN, RH33, V3, L1, AA(R, 2), NN(R), AFRANT, ASIDE, G, G2, G3, G4, PP2, DT
20059+
20090 LAGICAL LI.L2.L3
20095C
20100 G3T3(10,13,11), TENTRY
20110 10 RETURN
20310C
20320 13 P38=P8
```

Carterior of the contraction of

```
20330 TT=0.$ T0=0.
20340 RH033=RH00
20350 L2=+FALSE+ $ L3=+FALSE+
20360 RETURN
20370C
20350 11 IF(L1) G3T3 52
20395 IF(L2.4.L3)01T9 9
20390 52 DDT=(TIME-T3)*0.5
20395 IST3P=2
20400 53 IF(DDT+LT+DT) GAT9 51
20410 50 DDT=0+5*DDT
20415 IST3P=2*IST3P
20420 GO TO 53
20430 SI CONTINUE
20440 D3 99 I=1.IST3P
20450 TT=T0+1+DDT
20460 IF-10-12-001
20460 IF-(TT-6T-70) 60 T3 99
20470 DM=0. $ WH=0. $ NW=U
20480 D8 500 <=1,NWIN
20490 M=NN(K) $ DLY=AA(<,2)+0.000001
20500 IF(DLY-GE-TT) 67 TO 500
20510 GOT7(15, 16, 16),4
20520 15 CDF*1+0
20530 1F(TT-TC)20+20+21
20540 20 P11*(TC-TT)*(PR-PC)/TC+PC
20550 PI1=PI1+P9
20560 GØ TØ 30
20570 16 CDF=-0.4
20600 21 R=TT/TO $ RR=1.-R
20610 PD=PDØ+RR*RR*EXP(-2.*R)
20620 PS=PSØ+RR+EXP(-R)
20630 P11=PS+CDF+P0
20640 P11=P11+P3
20650 30 RH01=RH70+((P11/P5)=4G2)
20660 IF(P11-P38)36,36,37
20670 36 JSI GN=-1
20650 L2=.TRUE.
20770 303 P2=P11
20780 RH32=((P2/P30)**G2)*RH333
20790 X=P33/R4333
20900 GJ T3 38
20810 37 JSIGN=+1
20520 306 P2=PP2+P11
20830 RH32=((P2/P11)**G2)*RH31
20840 K=P11/RH31
20850 38 1/22=G4+(X-P2/RH32)+32++144+
20860 IF(1)22)40,39,39
20870 40 PRINT, *1,122 NEGATIVE*, 1,122
20880 STAP
20890 39 1,12=SORT(1,122) *1,51 GN
TDD+11-1)AA+SUR+SU=MDD 00005
20910 DM=D4+DDM
20920 WW= WW+P11+DD4/(G3+R431)
20925C
20930 500 C3NTINUE
20940 P38=P30+(G-1.)+WW/V3
20950 RH03##RH330+DM/V3
20960 99 C3NTINUE
20970 T9=TT
20980 P3=P34-P8
20982 IF(TIME.GE.TC)L3=.TRUE.
20983 RETURN
20984 9 R=TIME=1.0-R
20985 PD=PD3+RR+RR+EXP(-2.0+R)
20986 PS=PS#eRR#EXP(-P)
20987 P3=PS+PD+(AFRONT-0.4+ASIDE)
20990 999 RETURN
21020 END
30000 SUBROUTINE RESIST (LENTRY)
300100: THIS SUBROUTINE DETERMINES THE RESISTANCE FUNCTION, 300200: TRANSFORMATION FACTORS, AND REACTION COEFFICIENTS, AND
30030C: SUPPLIES THE REACTION VALUES FOR SPECIFIC DEFLECTIONS
30050 CAMMAN KINC.LDTYPE.KRF.KRAND.TIME.I.Y(100).AT.AH.YU.YFAIL.
```

ALL DESCRIPTION OF THE PROPERTY OF THE PARTY OF THE PARTY.

ACTIVITY S AND TO LOT IN THE SECTION STATES AND SECTION OF THE SEC

And have not the the second of the second second second second second second

The commence of the contraction of the contraction

make the transport was been as a second

```
PLANAR AFE ON THE ON TWO FOYS, I CASE, KPLATE, KCOMP, HE HAP, ESA
30054+
          HPC.45.FPC.FDC.EC. BS.FDYR.AS.U.APS.DP.JAREA.PAREA,74055.
30055+
          TKLY, VL1, VL2, NSLABS, NAMEF(2), KL3AD, ODLSLAB,
          W.P3, C3,L3C, S, ZLEN, CD, PS3, PD3, PR, PGXT, PC, TC, TO, DELAY, ''80, 2), PP(80, 2), RSAC(80, 2), INDEX(2), R(2),
30056+
30057+
30058+
                4477. V3.L1. AA(8.2). NV(8). AFR3NT. ASIDE, G. G2. G3. G4. PP2. DT
30100 REAL
                 B. ISTEFL, ICC, ICS, IAVS, KKI, KKZ, KSI, KS2
30120 G) TO (4, 500, 45) . LEV TRY
30130C
301400 " ENTRY 1: INPUT BEAM DATA * 30150 4 PRINT 615
30160 READ, ZLA, HB, BFL G, TFL G, TW, FDYS, I CASE, KPLATE, KCOMP
30165 ZLEN=ZLR/12.0
30170 ICASE4=ICASE-4
30180 ES=29E6
30185 BP=0 $ HP=0
30190 IF(4PLATE.E7.0) @77 11
30200 PRINT 616
30210 READ, BP, HP
30220 11 IF(<C3MP.E).0) G3T3 13
30230 PRINT 619
30240 PEAD, 48P, HS, FPC
30250 FDC=1.25*FPC
30260 EC=57619.0*SORT(FPC) $ ECKIP=EC/1000.0
30270 N=ES/EC
30280C * EFFECTIVE WIDTH OF CONCRETE *
30290 BS=7LB/4.0
30300 IF(BS.GT.BFLG+16.0*HS)BS=BFLG+16.0*HS
30310 IF(ICASE.E2.5) 67T3 13
30320 PRINT 619
30330 READ, FDYR, AS, D. APS, DP
30340 13 CONTINUE
30350 GAREA=ZLB+BFLG
30360 PAREA=PAREA+DAREA
30370C
30380C * ØUTPUT REAM DATA *
30390 PRINT 620, ICASE, 7LB, 49, 9FL G, FFL G, TW, FDYS
30400 IF(KPLATE-NE-O)PRINT 625, 8P, HP
30410 IF(<C94P.E9.0) G8T8 15
30420 PRINT 630, HBP, HS, BS, FPC, FDC, ECKIP
30430 IF(ICASE, GT, 5) PRINT 635, AS, D, FDYR, APS, DP
30440 AS=45*85/12.0 $ APS=APS*85/12.0
30450 15 C3NTINUE
30460C
30470C * DETERMINE BEAM PROPERTIES INDEPENDENT OF FDY *
30500 CALL TRANSCICASE4, ZKLM, ZKLMSE, ZKLMFE, ZKLMP, WLIS, WLZS,
30510+ (LIF, VL2F, VLIP, VL2P)
30530C • PROPERTIES FOR STEEL SECTION •
30540 AFL G=BFL G+TFL G
30550 48=2.0*4FLG+TW+(HR-2.0*TFLG)
30560 AP=HP+8P
30570 ASTEEL=AB+AP
30575 ZMASS=490+0+ASTFFL+ZLB/1729+0
30580 IR=2+0+(BFLG+TFLG+3/12+0+AFLG+(0+5+(HB-TFLG))++2)
30590+
          +TW+(H9-2.0+TFLG)++3/12.0
30600 YS=0.5*(HB+HP)*AP/ASTERL
30610 YBS=0.5*HB+HP-YS
30620 YTS=0.5+HB+YS
30630 HI=HBP+YTS
30640 ISTEEL=IB+AB*YS*YS+BP*HP**3/12.0+AP*(YBS-0.5*HP)**2
30650 ZS=AFLG=(HB-TFLG)+TW=((0.5+HR-TFLG)++P-YS+YS)+AP+(YBS+0.5+HP)
30670 IF(KC3MP-E0-1) RETURN
30680 ZCC=ZS $ ZCS=ZS
30690 ICC=ISTEEL $ ICS=ISTEEL
30700 PETHRY
39710C
30.750C * ENTRY 3: DETERMINE REAM PROPERTIES DEPENDENT ON FUY * 30.760 45 IF(<Comp.ne.1) GJTO 79 30.770C * PROPERTIES FOR COMP)SITE SECTION * 30.770 ASR=AS*FDYR/FDYS $ APSR=APS*FDYR/FDYS
30 79 0C
            NEGATIVE MAMENT SECTION .
30810 IF(ICASE-F9-5)9779 50
30820 YC=(ASR=(4S-D)+APSR=(HS-DP)+ASTERL+H1)/(ASR+APSR+ASTERL)
```

BANKARAN MARKARAN BANKARAN BAN

4.00

The second state of the second se

```
30830 ICS=ASR+(YC-HS+D)++2+APSR*(YC-HS+DP)++2+ISTEEL
              +ASTEEL *(HBP+YTS-YC) **2
30850 ASTELP=0.5*(ASTEEL-ASR-APSR)
30860 ZTC=TFLG+(ASTFLP-AFLG)/TW
30870 E=YTS+HBP-HS+D
30880 EP=YTS+HBP-HS+OP
30890 EPP=YTS-0.5*TFLG
30900 EPPP=EPP-0.5*2TC
30930C
30940C * POSITIVE MOMENT SECTION *
30950C * ELASTIC MOMENT OF INERTIA *
30960 SO TERMI=N#ASTEEL/BS
30970 YC=-TERM1+SORT(TERM1+TERM1+2.0+TERM1+H1)
30980 IF(YC+GT+HS) 60T0 55
30990C * YEUTRAL AXIS IN SLAB *
31000 ICC=ISTEEL+ASTEEL+(H1-YC)++2+B5+YC++3/(3+0+N)
31010 G0T0 60
31 020C ·
               NEUTRAL AXIS BELOW SLAB *
31030 S5 YC=(BS*HS*HS+2.0*N*ASTEEL*H1)/(2.0*(RS*HS+N*ASTEEL))
31050+ +BS+HS*(YC-0.5*HS)**2/N
31060C * PLASTIC SECTOR
31040 ICC=ISTEEL+ASTEEL+(H1-YC)++2+BS+HS++3/(12-0+V)
31060C * PLASTIC SECTION MODULUS *
31070 60 BSU=0.85*FDC*BS/FDYS
31090 ZC=ASTEEL/BSU
31100 IF(2C.GT.45) G9T9 65
31110 IF(2C.GT.HBP)@T3 62
31120C +
              NEUTRAL AXIS IN SLAB (ABOVE BEAM FLANGE) .
31130 CCC=ASTEEL*(YTS+H9P-0.5*7C)
31140 GOT# 75
31150C +
               NEUTRAL AXIS SELEN BEAM FLANGE (ENCASED BEAM) +
31160 62 ACU=RSUMHBP
31170 E=YTS+0.5+HBP
31180 G9T9 68
31190C *
               * BALZ WELZER STAR ANTON
311900 # VEUIRRE 331200 65 ACU=BSIJ*HS
31210 E=YTS+HBP-0.5*HS
51220 69 ASTELP=0.5*(ASTEEL-ACU)
31230 IF(ASTELP-GT-AFLG)GGT3 70
                NEUTRAL AYIS IN BEAM FLANGE *
31250 7C=HBP+ASTELP/BFLG
31260 ZCC=ACU+E+2.0+ASTELP+(YTS-0.5+(ZC-HRP))
31270 G7T7 75
31280C * NEUTRAL AXIS IN BE : WER *
31290 TO ZC=(ASTELP-AFLG)/TW+PB --TFLG
31300 EP=YTS-0.5+TFLG
31310 EPP= SP-0.5*(7C-49P)
31320 7CC=ACIJ+E+2+0+AFLG+EP+_-J++++ (ELP-AFLG)+EPP
31330 75 CONTINUE
31350C
31360C * DETERMINE RESISTANCE 1 -2 5 (1974L) FOR BEAM *
31370C * (9 IS IN UNITS OF LR. 4. IN LB/IN. AND Y IN INCHES ) *
31375 78 CALL COEFCICASE4.ASS.PSS.AF.BF.ICC.ICS>
31390 IF(ICASE.GT.5)GOTO 80
31390C
31400C CASE 5
31410 0U=2CC+FBYS/(BSS+2L3)
31420 441=ES+1CC/(ASS+2LB++3)
31430 YU=QU/441
31440 GFAIL=ZS=FDYS/(HSS+ZLR)
31450 YFAIL=26.4.9FAIL/(ES.STEEL/(ASS.ZLB..3))
31460 99T9 100
31470C
31480C CASES 6 AND 7
31490 80 91=2CS4FDYS/(BF+2LB)
31500 IAVG=0.5+(ICC+ICS)
31510 441=ES+1CS/(AF+2LR++3)
31520 Y1#01/4K1
31530 IF(ICASE-EQ-7) 6878 85
31540 QU=FDYS+(2CC+2CS)/(855+2L8)
31550 QFAIL=2.0*FDYS*Z$/(B$S*ZLB)
31555 QS1=FDYS+ZS+12.0/ZLB
31556 451=E5+15TEEL+384+0/2LB++3
31560 0070 90
```

and the second second second second second

A THE STATE OF

And opening the control of the contr

```
31570 95 99=F0YS*(7CC+0.5*7CS)/(9SS*7L3)
31580 OFAIL=1.5*FOYS*25/(BSS*2LB)
31545 7S1=FUYS+8+0/7L9
31546 KS1=ES*ISTERL*155.0/7L8**3
31590 90 KK2=ES*IAVG/(ASS*ZLB**3)
31600 YJ=Y1+(QU-Q1)/442
31630 YSI=251/451
31640 <52=55*15TEEL/(ASS*2L9**3)
31660 YSU=YS1+(0FAIL-0S1)/482
31670 YFAIL=26-4+(YS1+YSU+(1-0-QS1/QFAIL))
316300
316900 * ADJUST RESISTANCE CUPVE FOR SLAB DEAD LOAD * 31700 100 00L=00LSLAB+490+0*485FEDL*2LB/1728+0
31730 YDL=00L/441
31740 IFCKRAND.NE-1)PRINT 633,00L,YDL
31750 YI=YI-YOLS YIJ=YU-YOLS YFAIL=YFAIL-YUL
31760 01=01-00L$ 3U=3U-3DL$ 0FAIL=3FAIL-13L
31770C
317800 * 36TPUT RESISTANCE CHRVE *
31790 IF(KRAND-E0-1) 03T3 335
31900 PRINT 650
31910 IF(ICASE+E9+5) 00T3 320
31820 PRINT 660, 31, Y1
31830 320 PRINT 660, 21, YU, 2FAIL, YFAIL
31840 335 CONTINUE
31950 RETURN
31960C
31870C * ENTRY 2: DETERMINE THE RESISTANCE (131AL) 3F THE BEAM
                       AS A FUNCTION OF Y(1) .
318900
318900
31900 500 IF(Y(I).GT.YFAIL)GJT3 560
31910 IF(Y(I) - GT-YU) G313 540
31920 IF(ICASE-GT-5)99T1 520
31930C
31940C * ELASTIC RANGE - CASE 5 *
31950 ZKLM=ZKLMSE
31960 VL1=VL1S $ VL2=VL25
31970 GT=Y(I)*(()
31980 RETURN
319900
32000 520 IF(Y(I).GT.YI)G3T3 530
32010C
32020C . ELASTIC PANGE - CASES 6 4 7 4
32030 74L4=74L4FF
32040 VL1= A.IF $ VL2=VL2F
32050 9T=Y(1)*441
32060 RETURY
32070C
32080C * ELAST3-PLASTIC RANGE - CASES 6 4 7 *
32090 530 ZKLM=ZKLMSE
32100 MI=MIS $ MS=MS.
32110 07=01+442*(7(1)-71)
32120 RETURN
32130C
32140C * PLASTIC RANGE - ALL CASES *
32150 540 ZKL4=ZKL4P
32160 VL1=VL1P $ VL2=VL2P
32170 2T=2U+CYCL)-YUD+CQFAU,-2UD/CYFAU,-YUD
32140 RETURN
321900
322000 * BEAM COLLAPSED (SET RESISTANCE TO SMALL VALUE) *
32210 560 QT=1E-10
35530C
32240 615 F3RMAT(/*INPUT L3, H3, 9F, IF, TW, FUYS, ICASE, <PLATF, <C3MP*)
32250 616 F3RMAT(/*INPUT 3P & HP (F)R BJTT3M CJVER PLATE)*, +)
32260 618 F3RMAT(/*INPUT H3P, H5, F*C (F3H C3MP35ITE REAM)*, +)
32270 617 F3RMAT(/*INPUT FUYR & AS-D, APS, UP AT BEAM SUPP3RT*, +)
32240 620 FARMAT(//*PRAPERTIES OF STEEL SUPPART BEAM -- SUPPART TYPE NA.*, 32270+ 12./.* 1.R =*,F6.1.* IN.*,5%,*4R =*,F6.2.* IN.*,6%,*8F =*, 32300 F7.3.* IN.*,/,* IF =*,F0.3.* IN.*,5%,*TW =*,F6.3.* IN.*,4%,
            *FDYS ***F9.1.* PS[*]
32310+
32320 625 FARMAT(/* BP = ... F6.2. 1 N. .. 54. . HP = ... F6.3. 1 N. ..)
32330 630 F3RMAT(/+ 11:10 =+.F6.2.+ [N.+.5X.+45 =+.F6.2.+ [N.+.4X.
```

The best of the production of the same of

```
4X, *FDYR = *, F9.1, * PSI+, /, * A'S = *, F7.4, * S9 [N./F[*, 4x,
32390+
            *D* =*,F7.3,* [N.*)
32390 633 FJRMAT(/*79L = 4, F10. 2, 4 LA
                                                 YDL =**F8*4*# [V**)
32400 650 F3RM4[(//*L340-75FL50[[]) CURVE*./.5x.*7[ (L9) 32410 660 F3RM4[(F12-2-F12-4)
                                                                             Y ([N.)+)
32420 EVD
40000 SUHRBUTINE COSE CICASSAASSARSARABELICENESUP)
40010C
1)0200 THIS SUBRUUTINE DETERMINES DEFLECTION AND MIMENT COFFFICIENTS
         FIR TEE BEAMS WITH VARIABLE MIMENT OF INERTIA
40040C
40050 REAL ICEN, ISUP
40060C: CASE 5. JYE-WAY SIMPLY SUPPORTED WALL 400 '0 ASS=5.0/384.0
40080
               955=0-125
40090 RI=1SUP/ICEN
             00 T3(270, 60, 70), ICASE4
40110C
40120C: CASE 6. 3NE-WAY FILED END WALL
40130 60 BF=(+00953++03213*R1)/(+211++239*R1)
40140 AF=+00132++01169*RI-BF*(+0223++1023*R1)
40150 RETURN
40160C
40170C: CASE 7. 3NE-WAY PROPPED CANTILEVER WALL 40190 70 RF=(.0109+.030n*RI)/(.1926+.1407*PI)
4019( AF==.00439-.00342+PI+PF*(.08333+.02033*RI)
40200 270 RETHRY
40210
             END
SOOOD STARBUTTINE TRANS (ICASE4, KLM, KLMSE, KKLMFL, KKLMP, KLIS, KL2S,
             VLIF, VL2F, VLIP, VL2P)
50010+
50029C
50030C THIS SHARBUTINE DETERMINES TRANSFORMATION FACTORS AND
50040C DYNAMIC REACTION COEFFICIENTS FOR ONE-WAY BEAMS
50050C
50060C ALL CASES
50070 TKLMSE=0.78
50080 ZKLMP=0.66
50090 VL1S=0-107
50100 VL2S=0-393
50110 VL1P=0-125
50120 VL2P=0.375
50130 GOT9(300,310,320),1CASE4
50140C
50150G CASE 5
50140 300 74LM=74LMSE
50170 VL1=VL1S
50190 VL7=VL85
50190 RETIRN
2000C
50210C CASE 6
50220 310 14L4FE=0-77
50230 VL1F=0-136
50240 VL2F=0-364
50250 GCT9 330
50260C
50270C CASE 7
50280 320 74LMFE=0.73
50290 VL1F=0-165
50300 VL2F=0.459
50310 330 KLM=KLMFE
50320 W.1= W.1F
50330 VL2=VL2F
50340 RETHRY
50350 END
              CURROUTINE RANDOM (TENTRY)
 70000
70010C THIS SUBROUTINE INPUTS MEAN AND STANDARD DEVITTONS FOR RANDOM 70020C VARIABLES) GENERATES RANDOM VALUES! AND CON1936. REQUIRED 70030C NUMBER OF CASES TO BE RINE AND OUTPUTS FINAL MESILES AND SUMMARY
70040C
 70050 CBM43N KINC+LOTYPE+KRF+KRAND+TIME+I+Y(100)+OT+GU+YU+YFAIL+
 70052* ZLB. HB. BFL G. TFL G. TW. FDYS. I CASE. KPLATE. KCJMP. HP. BP. ES.
```

The state of the state of the state of

MANAGEMENT BOTH SALES OF THE SALES

```
HPC, HS, FPC, FDC, FC, PS, FDYP, AS, D, APF, DP, DARFA, PAREA, MASK,
70054+
        /KLA, VLI, VL2, NSLARS, NAMEF(2), KLJAD, TOL SLAR,
70055+
         # P3. C3.L 1C. 5. 7L 54. CD. PS3. PD7. PR. PEXT. PC. TG. TO. D9. AY.
70056+
         TT(RO, 2), PP(RO, 2), RFAC(RO, 2), INDEX(2), BR(2),
        VRI V. RH 19, V3, L 1, 44(4,2), 44(4), 4FR 34T, 4SI DE, G, G2, G3, G4, PP2, DT
70058+
70080
           COMMON /RAND/ TIMEC
            DIMENSIAN CHI25(7), CH1975(7), T015T(7)
70090
70100C
70110C VALUES FOR 97.5% (F=19.24.2).34.39.44.49)
            DATA CHI25/ . 4684, . 5167, . 5533, . 5325, . 6065, . 6267, . 6440/
70120
70130
            DATA CH1975/1.7295/1.6402/1.5766/1.5244/1.4903/1.4591/1.4331/
70140
            DATA TDI 57/2.093, 2.064, 2.045, 2.032, 2.022, 2.016, 2.010/
70150C
70160
            G7T3(5,50,70), LENTRY
70170 5 YDIMMY=XN3RM1(-1.0.0.0.0.1.0)
70190C INITIALIZE RAND3M NUMBER GENERATOR
            PRINT, /, *INP'IT NRAND*,
70190
            READ, VRAVO
70200
70210
            07 47 1=1. NRAND
70220
            XDUMMY=XN3R41(0.0.0.0.1.0)
         47 CONTINUE
70230
            INDEX=0$ SPS3=0$ SCPS3=0
70240
70250
            I CHECK=20
70250C
70270C
        INPIT MEAN AND STANDARD DEVIATION FOR RANDA WARRANLES
70275
            1F(L3C.F7.2)G3T3 30
70280
            PRINT 87
            READ, SMEAN, SSD
70290
70410C STEEL (NON-COMPOSITE AND COMPOSITE) SUPPORT REAMS
70420 30 PRI 4T 86
70430
            READ, FDYSMEN, FDYSSD
            IF(4C3MP.EQ.1.AND.1CASE.GT.5) GOTO 40
70432
70440
            IF(LJC.EQ.1)PRINT 96
70445
            IF(LAC. NE. 1) PRINT 95
70450
            RETURN
70452
       40 PRINT SR
            READ, FDYRAEN, FDYRSD
70454
            IF(L3C.EO.L)PRINT 97
70456
            IF(L3C. NE. 1) PRINT 99
70459
70459
            RETURN
70460C
70470C
        GENERATE RANDIM VALHES
70570 50 FDYS=X43PM1(0.0.FDYSMEN.FDYSSD)
            IF(FDYS+LF+0) (NTA 50
70580
            IFCKCTMP.NE.1. TR. ICASE. ED. S) GTT 3 SR
70581
       55 FDYR=KNIRMICO.O.FOYRMEN.FDYRSDI
70592
            IFCFDYR-LE-O-AND-FDYRMEN-NE-OXSTTE 55
70593
70584 58 CONTINUE
            IF(L3C.F7.2.3R.SMEAN-EQ.O) GITA 65
70590
       60 S=XN3RM1(0.0, SMEAN, SSD)
70600
            IF(S-LE-0)GIT) 40
       65 INDEX=INDEX+1
70610
            RETHRY
70620
79630C SIM VALUES OF PSE AND PSE+2 FER USE IN STATISTICAL ANALYSIS
            CPS3=SPS3+PS3
70640
            $$P$8=$$P$0+P$3+P$4
70650
70660C
70670C 3HTPHT FINAL RESULTS
70730 76 IFCKCOMP-F9-1-AND-1CASE-GT-5) G3T3 78
            IF(L)C.59.1)PRINT 92.FOYS.5.PSJ.TIMEC
IF(L)C.45.1)PRINT 90.FOYS.PSJ.TIMEC
70 732
72734
70736
            01- E1 ED
70734
       73 IF(L3C.FO.I)PRINT 93.FDYS.FDYR.C.PS3.II46C
            IF(L3C. VE. 1) PRINT 44, FDYS, FOYR, PS3, TIAEC
70739
70740 90 IFCINDEX-LT-ICHECK) RETURN
79.750C
TO 1600 DETERMINE MEAN, STANDARD DEVIATION, AND STANDARD ERROR FOR PS&
            23011=645
70770
70790
            1454N=SPS3/2N1
             SD=SORTC(SSPS)-34J+3MSAN+74FAN)/344)
70790
            STDERR=SD/(SORT(7N3-1))
TORIOR CHECK IF MAYIMM DE 50 PSA SAMPLES ABTAINED
70420
            1F(19054-50-50) G1T3 62
TORBOOK LIECK IF HOT CONFLUENCE INTERVAL FOR MEAN PSD VALUE IS
```

Control of the Control of the Control

PROGRAM STBEAM (CONCLUDED)

```
70447
                     18 (160 (C1+0-10 - MASH ) \ (6 \ (6 + \ ) = (4 + ) \ ) \ (7 \ ) \ (7 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ (8 \ ) \ 
73350C
70840C CANFIDENCE INTERVAL IS WITHIN 108 -- DETERMINE UPPER LIGHT OF
TOWARD 95% CONFIDENCE INTERVAL FOR STANDARD DEVIATION
TOWARD PROPAGALILITY VALUE AND LITE 95% CONFIDENCE INTERVAL DEPER LIGHT
TOWARD 6% SOURSONCSORT(CHIESC((INDEX-15)/5)))
TAPATIC CHECK IF MAKIMAM OF SO PRI SAMPLES SHEALAFT
71917
                     18(14)8(+8)+5))(0)[3:53
739 MY CHECK IN HORSE VALUE BE 35% CONFIDENCE INTERVAL HOR STANDAY
709301 07/11/10 IS SITHIN 0-10445AN 16 THE STANDARD DEVIATION 7094) IF(((SDU-SD)/Z45AN)-GLO-10)GIT 61
719500
709600 95% CONFIDENCY INTERVAL IS MITHIN 10% FOR HOLD MEAN AND ROA
70970C PRIBARILITY VALUE -- THERFFARE SUFFICIENT SAMPLES IRTAINED
TOPEDO DEFERMINE FOR CONFIDENCE INTERVALS FOR MEAN, STANDARD DEVIATION
70990.
71 DOOD AND 104 AND 904 PRESIDENT VALUES
               D3 SMEANL=ZMEAN-STDERR* FDISECCINDEX-15)/5)
71 21 2
                     74FANU= (46AN+STORAA+TOIST((INDEX-15)/5)
7100)
71030
                     SOL=SO/(STRT(CHIA75((IA)E(-15)/5)))
71040
                     P10=7454V-1.232*SU
                    P10L={M=AN=1+2H2+50U
LDJ=*M=AN=1+9H2+50L
/1050
71 353
                     27J=147AV+1-232+50
71 171
71 140
                     P#0L=41EAN+1.232450L
71091
                     P90= 34644+1 . 222+40
7117)
                     990U-745AV-1-242450U
                     P40H= * 4F44+1. 242+ 49H
41110
71120
THISTO DIFFOR CLAFFER CAL PARAMETERS OF INCIDENT COLLAPSE POFCEOUS
                    PREST 100, ENGAN, ENGAND, ENGAN DISCUS SUBJECTION FOLLOPED DE
711-3
                        P90, P90L, P90:J
71150+
71100
                     PRINT 105, INDEK, STUERP
7117)
71120C 35% CANFIDENCE INTERVAL IS NOT ALTHIN 10% FOR STOR ME A GAY AND 31
71 / 304
71 3100 VILLIES -- THEREFIRE PATAIN 5 ADDITIONAL SAMPLES
71 221)
               41 ICHECK=1CHECK+5
71230
                     RETIAN
71 '41C
71 .73
             RE FURNATIONAL MEAN AND STANDARD OF THILLY A PRINCESSORS
71-40 47 FEWATCHENPIT WEAR AND STANDARD DEVIATION FOR SEATE
11 '19 30 + 3444T(24.2. £1 ). 2. £14. 3)
7131)
             12 = 1944[(=9.1,F11.2,F10.2,F14.3)
             13 FJEMAT( FO. 1, F11. 2, F13. 2, F14. d)
71:323
11933 94 FIRAATC2F3.1, F19.2, F14.33
             33 F3943[(///. 44. 4F): 4. 74. 42034, 64. 4034, 4775 (1944)
1341
7:757 OK ETRATICALL ACCOUNTS ACCOUNTS ACCOUNTS ACCOUNTS THE TELES
71556 17 F34445(///, 44, 4F)Y 54, 74, 4F)Y 84, 24, 454, 44, PS 34, 64,
                   enal abes Lines
11 15 40
71355 32 F7742T(///, 44, 44 )454, 74, 467474, 74, 48574, 64, 46711 4857 TIMES
71369 10) FIRMATONNIA ASTATISTICAL PRIPARTIES IN INCIPIENT PSIE
11 1170
                         //, 394, +3 12 CINFLO NOS LIMITOS./, 74, +1 FM+, 144,
71 747+
                         * VAL IF
                                                LIWER
                                                                         THERRODY, # 46A44, FEEters
                         2612-2-77 ** STANDARD DEVIATIONS $15-2-261 - 3-77.
71 1270
7141 )*
                         *5144742) ERRIR -*** 1-21
71 450 344 STIPS FND
71.440 F (10713) (533(1) (539)
7147) 15(4)10,20,20
71440 10 XJ=RAVE(-1.))
71440 20 X1=PAVE(3.))
71535 Krankle(0+35
71.51 - 729.787(-749-41.196-41.1)+(635-64-7331-34-4-7)
71 129 491541544749
71510 477124
 1242 . 41
```

or water the property of the second s

Standard Adding

FLAT

Flat Slab or Flat Plate

PROGRAM FLAT

The same of the sa

```
01000 PROGRAM FLAT(INPUT, GUIPUT)
01010Ct
         THIS ROUTING IS THE CONTROLLING ROUTING FOR THE PROGRAM
DIO20C: USED IN THE ANALYSIS OF REINFORCED CONCRETE FLAT SLARS
01030C
01050 COMMON KING.LDTYPE, KRF. KRAND. TIME. I.Y(100). Q.QU.YU.YFAIL.
01052+ ZLS, MS, FDY, AREA, ZMASG, ZKLM, VS1, VS2, PS0, PD0, PF, PEXT, PC, TC, TU, 01054+ P0, DELAY, S
01060 DIMENSION A(60), V(80), I(80), VS*80), QQ(80), PN(80)
01070 COMMON /SHEAR/ ISHEAR/JSHEAR/V. ¿ZAR/MEMB
01070 COMMON /RAND/ TIMEC
01110C . READ TITLE AND CONTROL PARAMETERS .
01120 5 PRINT 67
01130 READ 68-TITLE
01140 PRINT 85
01150 READ.KIMC.LDTYPE.KRF.KRAND
01160 DELAY=0
01160 CALL RESIST(1)
01190 CALL FORCE(1)
01200 IF (KKF . EQ . 0) GOTO 14
DIRIO CALL FILL(PINT.1)
            IF (KRAND.NE-1)GOTO 35
01270
            CALL FORCE(4)
01280
            CALL RANDOM(1)
            CALL RANDOM(2)
01290 34
            CALL RESIST(3)
01300 35
013100
01320C: MINIMUM, MAXIMUM, AND STARTING VALUES ARE DETERMINED FOR CASES
01330C: WHERE THE LEAD CAUSING INCIPIENT COLLAPSE IS TO BE FOUND 01340 13 IF(KINC-EQ-0)60TO 23
01340 13
01350
             PF=QU
             PFMAX=0
01360
01370
             PFMIN=PF/2.0
01380
            6919 20
             PF=(PFMIN+PFMAX)/2.0
01390 16
            CALL FORCE (2)
01400 20
01410 23
            IF (KRF.EQ.0)GOTO 24
01 420
            CALL FILL(PINT,2)
01 430C
          INITIALIZE VALUES FOR RETA METHOD (BETA=1/6) AND COMPUTE VALUES FOR FIRST TIME INTERVAL ASSUMING ELEMENT INITIALLY AT REST
01440C1
0145001
01460 24
             1=1
01470
             TIME=0
01460
            V(1)=0 $ Y(1)=0
01450
             DELTA=0.001
01495 JSHEAR=0
            IF CKRF . NE - 1 1 GOT 9 30
01500
            IF(TIME.GE.(DELAY-.00001))G8T8 30
01510 27
            TIME=TIME+DELTA
21520
            CALL FILL(PINI,3)
GBT8 27
01530
01540
01640 30
01650
            CALL RESIST(2)
            A(1)=0.0 $ VS(1)=0.0
            1(1)=TIME
01640
01.
6 340 5
        PROCEDURE FOR ALL SUBSEQUENT TIME INTERVALS
0.732
01710
             I=!+1
            IF (1.L7.81)G&T# 11
            PRINT 98.TIME
01720
01730 98 FERMAT(/*1=81: TIME ***F6*3**; FAILURE ASSUMED TO NOT OCCUR*)
            6918 8
01740
01750 )1
            TIME .TIME + DELTA
01760
             T(_)=TIME
             A(1)=A(1-1)
01770
01775
            IF (KRF+NE+0)GBT0 10
C1750
            CALL FORCE(3)
            PNCI: PEXT
01790
01800
            G@16 2
            CALL FILL(PIN1.3)
01830 10
01890
            PR(1)ePINT
01910 2
            CONTINUE
01980
            DB 8 .U=1.10
01530
              Y(1)=Y(1-1)+DELTA+V(1-1)+DELTA+DELTA+(A(1-1)/3.+A(1)/6.)
01540
             CALL RESIST(2)
```

and the state of t

A 52-4 YEA

THE PROPERTY OF THE PARTY OF TH

```
01960 4
            AREW=AREA+(PN(1)-0)/(ZMASS+ZKLM)
01970
             ADELTA ANEW-A(1)
01980
             A(1) SANF
01985 IF (ANEW-EQ-0) FRINT, $1985$, IIME, PN(I), 40, ZMASS, ZKLM, Y(I), A(I-1)
             IF (ABS (ADELTA/ (ANEW+1E-10)) - LT-0-01) G0T0 9
01990
02000 8
             CONTINUE
             A(1) FANEW-ADELIA/2.0
02020 PRINT 80.1 ME.PF.A(1).Y(1)
02030 9
             CON1 INUE
             Y(1)#Y(1-1)+DELTA+V(1+1)+DELTA+DELTA+(A(1-1)/3.+A(1)/6.)
02040
             V(1)=V(1-1)+DELTA+(A(1)+A(1-1))/2.0
0205C
            VS(1)=AREA+(VS1+PN(1)+VS2+Q)
02060
02070
            00(1)=0
02080 IF (ISHEAR-EQ-1-AND-VS(I)-GI-VSHEAR) JSHEAK=1
02085 IF (JSHEAR-EQ-1-AND-MEM5-EQ-0)6016 7
02090C
02106C: CHECK FOR MAXIMUM DEFLECTION OR FAILURE
           IF MAXIMUM DEFLECTION REACHED, WALL DID NOT FAIL
02110C:
            IF(Y(1).LE.Y(1-1).AND.PN(1).LE.PN(1-1))GUT0 6
02120
            1F(Y(1).LT.0)G0T0 6
02130
            IF (Y(1) . GE . YFAIL )GOTO 7
02135
02140
            IF(TIME DELAY-GE-0-010)DELTA=0.002
02160
             IF (IIME-DELAY-GE-0-020)DELTA=0-005
            IF (TIME-DELAY.GE.O-100)DELTA=0.010
02170
            IF (TINE-DELAY-GE-0-500) DEL A-0-050
02180
021900:
           IF FAILURE DEFLECTION REACHED. ELEMENT FAILED
02210
             GOTO 1
02230C: INTERVAL HALVING PROCEDURE TO DETERMINE LOAD CAUSING INCIPIENT 02240C: COLLAPSE FOR CASES WHERE DESIRED 02250C: ELEMENT DID NOT FAIL -- SET PFMIN TO PF
            CONTINUE
02260 6
             IF (KINC.EQ.O)GOTO 18
02280
02290 36
            PFHIN=PF
02300 IF (PFMAX-GT-0)G818 16
01530
             PF=2.0+PF
02320
             GOTO 20
02330Ct
           ELEMENT FAILED -- SET PFMAX TO PF
            CONTINUE
02340 7
             TIMEC=TIME
02350
02370
            IF (KINC.EQ.O)GETB 18
            PFMAX-PF
02380 37
C2390C:
           CHECK TO SEE IF LOAD RANGE IS WITHIN DESIRED ACCURACY
02409 17
             IF ((PFMAX-P/MIN)/PFMIN-GT-0-01)G0T0 16
02410
            IFCKRAND.NE.1360T0 13
            CALL RANDOM(3)
GOTO 34
02420
02430
02440C
02450C: GUTPUT DATA INCLUDES THE MAXIMUM DEFLECTION AND TIME OF
OR46OC: OCCURANCE FOR A NON-FAILING ELEMENT OR THE TIME AND VELOCITY
02470C: AT COLLAPSE FOR A FAILING ELEMENT. SPTIONAL SUTPUT IS THE
02 480C: ENTIRE BEKAVIOR TIME-HISTORY.
024900
ORSOGS: BUTPUT LEAD DATA
02510 18
              CALL FERCE(4)
02520C
0E530C: BUTPUT FINAL RESULTS
02535 IFCJSHEAR-EQ-1-AND-MEMB-EQ-03GRT0 40
02540 JFCYCI3-LT-YFAJL3PRINT 70-YCI3-TCI3
0255: IFCYCI3-GE-YFAIL3PRINT 71-TCI3-VCI3
02560 IF (JSHEAR-LQ-1)PRINT 96
02570 GBT8 42
02577C
02578C CHECK TO SEE IF ENTIRE TIME-HISTORY IS DESIRED 02579 40 PHINT 97. ((1). V(1) 02580 42 PRINT 72
02590 READ.M
              1F (M.E0.0)G0T0 25
02400
02680 PRINT 76,(T(J),PN(J),A(J),V(J),Y(J),00(J),VS(J),J=1,1)
02690 25 PRINT 77
02700 GBTG 5
02710C
02720 67 F@RMAT(/*INPUT TITLE***)
02730 68 F@RMAT(A59)
```

THE RESIDENCE OF THE PROPERTY OF THE PROPERTY

```
02740 70 ft "MAT(/*NØ FAILURE - MAX DEFLECTION @F*,F6.2, 02750+ \ IN- REACHED AT*F7.3,* SEC*)
02760 71 F .FAT!/*FAILURE BCCURRED AT*, F7.3, * SEC (FINAL VELBUITY **,
02830 76 F.... FIRE FRESSURE MCCELERATION VELOCITY
02840+ 6. , FIRST 99 V5-0/,
02850+ (F.-3,-9-3,F12-1,F12-2,F12-4,F10-2,F9-0))
02860 77 FORMAT(///,7(4------))
02870 80 FORMAT(/+ACCELERATION NOT GONVERGING AT TIME #4,F6-3,
                    * SEC (PF =+.F7.3.* PS11*/*
                                                             A(1) SET EQUAL T9+>
                    F8-1. (AVG OF LAST 2 ITERATIONS) */ *
F8-4. * IN. *)
02890+
02900+
02910 85 FORMATC/+INPUT KINC, LDIYPE, KRF, KRANDCI=RANDOM3+, +3
02930 90 FORMAT(/*ARE REACTIONS TO BE OUTPUT TO FILE (Q=Ng,1=YES)*,*)
02940 95 FORMAT(/*INPUT NAME OF SLAB REACTION DATA FILE*,*)
02945 96 FORMAT(/+SHEAK FAILURE -- TENSILE MEMBRANE RESISTANCE+
02946+
          . CONTINUED+)
02948 97 FORMATC/+SHEAR FAILURE AT+, F7.3, + SEC (FINAL VELOCITY =+,
02949+
          F7.20 IN./SZC)0)
029500
02960 999
               STO!
U2970
              END
10000 SUBROUTINE FORCE (IENTRY)
10010C THIS SUBROUTINE INPUTS THE LOAD PARAMETERS AND DETERMINES 10020C THE LOAD AT A GIVEN TIME FOR THE FOLLOWING LOAD TYPES: 10030C 1. IDEALIZED BLAST LOAD (FRONT OR SIDE FACE) 10050 COMMON KINC.LDTYPE.KRF.KRAND.TIME.I.Y(100).Q.QU.YU.YFAIL.
10052+ ZLS, MS, FDY, AREA, ZMASS, ZKLM, VS1, VS2, PS8, PD8, PR, P, PC, TC, TO, 10054+ P8, DELAY, S
10060 DIMENSION TT(20).PP(20)
101200
10130 IF(LDTYPE+EQ+5)GOT# 500
10150 GOTO(100,200,300,4), IENTRY
10160C
10170C + INPUT LOAD PARAMETERS +
10180C: LOCATION 1- FRONT FACE LOADING (USED IN ROOM-FILLING PROCEDURE)
10190 100 M=1000-0 $ P0=14-7 $ C0=1120-0
10200 IF(KRF.NE-1)G0T0 102
10210 LOC-1
10220 LF (KRAND-EG-1)RETURN
10230 PRINT 600
10240 READ.S
10250 GBT# 105
10260C: L#CATION 2. TOP FACE L#ADING
10265 192 CD=0 $ LBC=2
10270 ZLEN=ZLS/12.0
10275 105 IF C" INC-E0-! DRETURN
10280 PRINT 6:0
10285 READ.PS#
10290 PR=2.0+PS0+(7.0+P8+4.0+P50)/(7.0+P8+PS0)
10295 GaT# 215
11000C
11010C CALCULATE LOAD PROPERTIES FOR GIVEN PEAK PRESSURE
11030 200 G0T0(205.210).LOC
11G40 205 PS8=(PR-14.0+P8+SQRT(196.0+P8+P8+196.0+P8+PR+PR+PR))/16.0
11050 GOT# 215
11060 210 PS8=PR
11070 215 PD8=2-5+PS8+P59/(7-0+P8+PS8)
1108U U#C##SQRT(1+0+(6+0*PS#)/(7+0*P#))
11090 TO-W++0.3333/(2.2399+0.1886+PS0)
11100 GOTO(220.225).LOC
11110 220 TC+3.0+S/U
1:120 PC=PS8+(1-TC/TO)+EXP(-TC/TO)+PD8+(1-TC/TO)++2+EXP(-2+TC/TO)
11130 CD-1-0
tti 40 RETURN
1.150 225 TA=ZLEN/U
11160 TA2=TA/2.0
1170 TARTORIAR/TO
11:30 PA=P:90(1-TASTO)0EXP(-TASTO)0COT0-10TASTO)000EXP(-20TASTO)
 1190 RETURN
IEC:OC CALCULATE LCAD
```

returns in the second s

A STATE OF THE PROPERTY OF THE

Sidd the total of the state of

```
12030 300 G919(305,310),L0C
12040 305 TTO=T1ME/T0
12050 IF(TIME-GI-TC)G919 320
12060 P@PC+(TC-TIME)+(PR-PC)/TC
12070 RETURN
12080 310 TTO=(TIME-TA2)/TO
12090 IF (TIME - GT - TA) GOTO 320
12100 P=PA+TIME/TA
12110 RETURN
12120 320 IF(TTO.GE.1.0)6010 330
12130 P=PS0*(1-TTO)*EPP(~110)*CD*PD0*(1-TTO)**2*EXP(-2*TTO)
12150 RETURN
12160 330 P=0
12170 RETURN
13000C
13010C PRINT LUAD DATA
13020 4 IF(KINC-EQ-0)GOTU 400
13030 PRINT 640-LDTYPE
13040 GSTØ 410
13050 400 PRINT 645, LDTYPE
13060 410 CONTINUE
13070 415 GOTO(420,425),LOC
13080 420 PRINT 650
13090 GOT# 430
13100 425 PRINT 655
13110 430 PRINT 660.W.PO.CO
13120 IF (KRAND-NE-O)RETURN
13130 GOTO(435,440),LOC
13140 435 PRINT 685,5,TC,PR
13150 GOTO 445
13160 440 PRINT 670. ZLEN. 7A.PA
13170 445 PRINT 675.U.TO.CD.PS0.PD0
13180 RETURN
13500C
13510C LØAD TYPE 5 -- ARBITRARY LØAD SHAPE
13520 500 GØTØ(510,520,530,540), IENTRY
13530C
13540C
          INPUT LOAD DATA
13550 510 PRINT 680
13560 READ, NPOINT, (TT(J), PP(J), J=1, NPOINT)
13570 FACTOR=1.0
13580 IF (KINC-E0-0)G010 518
13590 PPAX=PP(1)
13600 DB 515 J=2.NP@INT
13610 515 IF(PP(J)-GT-PMAX)PMAX=PP(J)
13620 518 Px=PP(2)-PP(1)
13630 Tx=TT(2)-TT(1)
13640 JJ=1
13650 RETURN
13660C
13670C CALCULATE MAXIMUM LOAD
13680 520 FACT4R-PR/PMAX
13690 GBT# 518
13700 RETURN
13710C
         CALCULATE LOAD
13720C
13730 530 IF(TIME+LE+TT(JJ+1))G@T# 535
13740 JJ=JJ+1
13750 PX=PP(JJ+1)-PP(JJ)
(LL)17-(1+LL)11*XT 087E1
13765 IF (TX-EQ-0)TX-1E-10
13770 GBT9 530
13780 535 P=FACTBR+(PP(JJ)+(TIME-T1(JJ))+PX/TX)
13790 RETURN
13800C
13800C

13810C PRINT LOAD DATA

13815 540 IF(KINC-EQ-1)PRINT 640,LDTYPE

13820 IF(KINC-EQ-0)PRINT 645,LDTYPE

13825 PRINT 690

13830 DO 545 J=1,NPOINT

13840 P=FACTOROPP(J)
13850 545 PRINT 695,TT(J),P
13860 RETURN
```

According to the second se

Actor all the second second

14000C

```
14010 600 F@RMAT(/#IMPUT S+++)
14020 610 F@RMAT(/#IMPUT PS#+++)
14070 640 FORMAT( / *LOAD CAUSING INCIPIENT FAILURE IS AS FOLLOWS: *.
           /.5x.+LGAD TYPE NUMBER+,12)
14071+
14080 645 FORMPT(/*PHOPERTIES OF LOAD ACTING ON WALL ARE AS FOLLOWS: *,
           /.5x. +LOAD TYPE NUMBER+.12)
14090 650 FORMAT(8X. +(FRONT FACE)+)
14100 655 FORMAT(5X. +(SIDE OR TOP FACE)+)
14110 660 FURMAT(10X,+W =+,F8-1,+ KT P8 =+,F6-2,+ PSI
           F7.1. FPS+)
14111+
14120 665 FORMATCIOX +S =+ F6 . 1 . FT
                                                  TC =+.F6.3.+ SEC
           F7.3. + P51+)
14130 670 FORMATCIOX.+L =+.F6.1.4 FT
                                                  TA =+.F6.3. SEC
                                                                            PA st.
14131+
           F7.3. + PSI+)
14140 675 FBRMAT(10A,04U =0.F7.1)4 FPS TO =0.F6.3.* SEC
14141+ F5.1./.8X.0PS0 =0.F7.3.0 PSI PD0 =0.F7.3.0 PSI(0.1)
                                                                           CD =+.
14150 680 FORMAT(/+INPUT NUMBER OF LOAD POINTS AND THE TIME AND +
           PRESSURE AT EACH PRINT+)
14160 690 FORMAT(/10X+4TIME
                                        PRESSURE®)
14170 695 FORMAT(F15.3,F12.2)
15000 END
20000 SUBROUTINE FILL (P3, IENTRY)
20010C: COMPUTES AVERAGE AIR PRESSURE IN ROOM DUE TO BLAST WAVE 20020C: INCIDENT HEAD-ON UPON FRONT WALL.
20030C
20050 COMMON KINC. LDTYPE. KRF. KRAND. TIME. 11. Y (100). Q. QU. YU. YFAIL.
20052+ ZLS, HS, FDY, AREA, ZMASS, ZKLM, VS1, VS2, PS0, PD0, PR, PEXT, PC, TC, TO, 20054+ P0, DELAY, S
20080 DIMENSION AA(8,2),NN(8)
20090 LOGICAL LI.L2.L3
20095C
20100 GOTO(10,13,11), IENTRY
20105C
20110 10 PRINT 700
20120 READ-NUTNAV3
20122 RH00=0.076 $ L1=.FALSE.
20123 DELAY-1E10
20125 AT=0 $ AFRENT=0 $ ASIDE=0
20130 DE 18 I=1,NWIN
20140 PRINT 710,I
20150 READ+AA(I+1)+NN(I)+AA(I+2)
20160 AA(1,2)=AA(1,2)/1000.0
20161 AT-AT-AA(1,1)
20162 M=NN(1) $ 6878(12,14,14),M
20163 12 AFRONT=AFRONT+AA(1,1)
20164 GOT# 18
20165 14 ASIDE-ASIDE-AA(1.1)
20170 18 IF(AA(I)2)-LT-DELAY-DELAY=AA(I)2)
20175 AFRONT=AFRONT/AT $ ASIDE-ASIDE/AT
20180 700 FORMAT(/*INPUT NUMBER OF OPENINGS AND ROOM VOLUME (CF)**+1)
20800 710 FORMAT(/*INPUT AREA (SQ FT)*LOCATION CODE & DELAY(MSEC) **
            OFOR WINDOWS, 12,+)
20230 G=1.4 $ G2:1./G $ G3=1.-G2 $ G4=2./G3
20240 PP2=-1912
20250 G=SQRT(G=P#=32++144+/RH##)
20240 TAU=2.+(V3++(1./3.))/C
20270 DT=TAU/4.0
20280 RETURN
2031UC
20290 13 P30=P6
20330 11=0.8 70=0.
20340 RH838=RH88
20350 LP. FALSE. $ L3. FALSE.
20360 RETURN
20370C
20380 11 TF(L1)6878 52
20385 IF(L2.A.L3)G#T# 9
20390 52 DDT=(TIME-T#)+0.5
20395 ISTOP-2
20400 53 IF(DDT-LT-DT)G0T0 51
20410 50 DDT=0-5=DDT
20415 ISTOP=2=ISTOF
20420 GB TB 53
2043C 51 CBNTINUE
```

The state of the s

A STATE OF THE PARTY OF THE PAR

```
20440 D0 99 I=1.IST0P
20450 TI=T#+1+DD1
20460 IF(TT.GT.TO)G0 T0 99
20470 DM=0. $ WW#0. $ NW#0
20480 DØ 500 K=1.NWIN
20490 M=NN(K) $ DLY=AA(K+2)+0+0000001
20500 IF(DLY-GE-TT)G0 T0 500
20510 G@T@(15,16,16),M
20520 15 CDF=1.0
20530 IF(TT-TC)20,20,21
20540 20 P11*(TC-TT)*(PR-PC)/TC+PC
20550 P11=P11+P0
20560 GB TB 30
20570 16 CDF=-0-4
20620 PS=PS0+RK+EXP(-K)
20630 PI1=PS+CDF+PD
20640 P11=P11+P8
20650 30 RH01=RH00+((P11/P0)++G2)
20660 IF(P11-P30)36,36,37
20670 36 JSIGN=-1
20680 L2=-TRUE-
20770 303 P2=P11
20780 RH02=((P2/P30)++G2)+RH030
20790 X=P30/RH038
20800 G# T# 38
20810 37 JSIGN=+1
20820 306 P2=PP2+P31
20830 RH02=((P2/P11)++G2)+RH01
20840 X=P11/RH91
20850 38 U22=G4"(X-P2/RH@2)+32.+144.
20860 IF(U22,40,39,39
20870 40 PKINT. +U22 NEGATIVE +, U22
20880 STOP
20890 39 U2=SORT(U22)+J5IGN
20900 DDM=U2+RH02+AA(K,1)+DDT
20910 DM=DM+DDM
20920 WW=WW+P11+DDM/(G3+RH#1)
20925C
20930 500 CONTINUE
20940 P303P30+(G-1+)+WW/V3
20950 RH838=RH838+DM/V3
20960 99 CONTINUE
20970 TO-TT
20980 P3*P38-P8
20982 IF(TIME.GE.1C)L3=.TRUE.
20983 RETURN
20984 9 R=TIME/TO $ RR=1.0-R
20985 PD=PDG=RR+RR+EXP(-2.0+R)
20986 PS=PS#+RR+EXP(-R)
20987 P3=PS+PD+(AFRONT-0.4+ASIDE)
20990 999 RETURN
21020 END
30000 SUBROUTINE RESIST(IENTRY)
30010C * THIS SUBRRUTINE DETERMINES THE RESISTANCE FUNCTION, 30020C: TRANSFORMATION FACTORS, AND REACTION COEFFICIENTS FOR 30030C: A REINFORCED CONCRETE FLAT SLAB
30050 COMMON KINC, LDTYPE, KRF, KRAND, TIME, I, Y(100), Q, QU, YU, YFAIL,
30052+ ZLS, HS, FDY, AREA, ZMASS, ZKLM, VS1, VS2, PS0, PD0, PR, PEXT, PC, TC, TO, 30054+ P0, DELAY, S
30070 COMMON /SHEAR/ ISHEAR, JSHEAR, VSHEAR, MEMB
30080 REAL N. IG. MU(4), ICR(4), IC. IAVG. KE
30090 DIMENSION AS(4), APS(4), D(4), DP(4)
30100C
30110 GBT#(4,500,45), IENTRY
30120C
30130C . ENTRY 1. INPUT AND ECHO SLAB AND REINFORCEMENT PROPERTIES .
30140 4 PRINT 600
30150 READ, ZLS, C2, HS, FPC, FDY, ZLD, HD
30140 FDC=1-25+FPC
30170 EC=57619.0+SQRT(FPC)
30180 ES=29E6
```

AND Video proprietation in the residence in the residence of the second in the Second Second Second in the second and the

```
30190 AREA=ZLS+ZLS-C8+C2
30200 ECKIP=EC/1000.0 $ ESKIP=ES/1000.0
30210 PRINT 670
30220 D# 8 I=1,4
30230 PRINT 610,1
30240 8 READ, AS(1), D(1), APS(1), DP(1)
30242 PRINT 720
30244 READ, ISHEAR
30250 PRINT 711
30260 READ, MEMB
30270 IF (MEMB.E0.0)GOT# 15
30280 PRINT 706
30290 READ, ASCS
30300 ASCS=ASC$/12.0
30310C
30320C . DETERMINE PROPERTIES INDEPENDENT OF FUY .
30330 15 N=ES/EC
30340 ZMASS=150+0+AREA+HS/(150+0+1728+0)
30350 PRINT 620, ZLS, C2, HS, FPC, FDC, ECKIP, FDY, ESKIP, ZLD, HD
30360 PRINT 630
30370 DO 110 I=1.4
30380 P=AS(1)/(12+0+D(1)) $ PP=APS(1)/(12+0+D(1))
30390 PRINT 640, I.AS(I), P.D(I), APS(I), PP, DP(I)
30400C & CHANGE UNITS OF REINFORCEMENT FROM SO IN-/FT TO SO IN-/IN-
30410 AS(1)-AS(1)/12-0 $ APS(1)-APS(1)/12-0
30420 110 CONTINUE
30430 [6=HS+43/12+(N-1)+(AS(1)+(D(1)-HS/2)++2+APS(1)+(HS/2-DP(1))++2)
30460 RETURN
30480C . ENTRY 2. DETERMINE WALL PROPERTIES DEPENDENT ON FDY .
30490 45 CALL MEMENT(FDC.FDY.ES.N.O.1.0.AS.APS.D.DP.MU.ICR.IC)
30500 SUMMP=MU(1)+MU(2)+MU(3)-MU(4)
30510 1AV8=0.5+(1G+1CR(1))
30520C
30530C + DETERMINE RESISTANCE CURVE FOR SLAB *
30540 QU=4.0+(ZLS+C2)+SUMMP/.ZLS+AREA)
30550 KE=189.0+EC+1AVG/(ZLS-0.5*C2)++4
30560 YU=QU/KE
30570 YI=999.9
30590 YFAIL=YU+0+1/(AS(1)/D(1))
30600 IF (YFAIL-GT-30-0+YU)YFAIL=30-0+YU
3C610 IF(MEMB.NE-1)G9T# 25
30620C + TENSILE MEMBRANE BEHAVIER +
30630 20 TS=ASCS+FDY
30640 YT=QU+ZLS+ZLS/(20.25+TS)
30642 QT=QU
30644 IF(YT-LE-YFAIL)GOTO 22
30646 YT=YFAIL
30648 9T=20.25+YT+T3/(ZLS+ZLS)
30650 22 IF(YFAIL-LT-0-15+ZLS)YFAIL+0. -ZLS
30660 @FAIL=0.15+2G.25+TS/ZLS
30670C
30680C * ADJUST LEAD-DEFLECTION CURVE FOR SLAB DEAD LOAD *
30690 25 QDL=150.0+HS/1728.0
30700 YDL=GDL/KE
30710 QU=QU-QDLS QT=QT-QDLS QFAIL=QFAIL-QDL
30720 YUEYU-YDLS YTEYT-YDLS YFAIL-YFAIL-YDL
30730 IF (KRAND-NE-1)PRINT 633,00L, YDL
30740C
30750C BUTPUT LOAD-DEFLECTION CURVE
30760 IF (KRAND-EQ-1)GOTO 335
30770 PRINT 650
30780 *F(HEMS-E0-1)G0T0 332
30790 PRINT 660, QU, YU, QU, YFAIL
30800 GOTO 335
30805 332 IF(9T.NE.9U)60T0 333
30810 FRINT 660,QU,YU,QT,YT,QFAIL,YFAIL
30812 GETE 335
30814 333 PRINT 660,QU,YU,QU,YT,QT,YT,QFAIL,"FAIL
30820 335 CONTINUE
30822C
30824C + CALCULATE MINIMUM SHEAR RESISTANCE *
30826 VPS=3.0+S9RT(FPC)
30828 84=C2+D(4)
```

Contract the second of the second sec

The said the said the said the said of the said the said

À

おとれていることではないできませんできませんとう

7

```
30830 QSHR1=4+0+80+(HS+HD)+VPS/(ZLS+ZLS-80+80)
30832 B0=ZLD+(D(4)-HD)
30834 QSHR2=4.0+B0+HS+VPS/(ZLS+ZLS-B0+B0)
30836 VBS=2.0*SQRT(F"C)
30838 QSHR3=HS+VBS/(0.5+(ZLS-C2)+D(3))
30340 QSHEAR -QSHR1
30841 IF (KRAND+NE+1)PRINT 957, OSHR1, QSHR2, QSHK3
30842 IF (9SHR2+LT+9SHEAR)9SHEAR=9SHR2
30844 IF (QSHR3+LT+QSHEAR)QSHEAR=QSHR3
30846 OSHEAR=OSHEAR-ODL
30850 IF (KRAND-NE-1)PRINT 695,QSHEAK
30852 VSHEAR-OSHEAR-AREA-0-25
30860 RETURN
30870C
30880C . ENTRY 3. DETERMINE THE RESISTANCE AS A FUNCTION OF Y(1) .
30885 500 IF (JSHEAR-EQ-1)68TØ 520
30890 IF(Y(I)-GT-YU)G0T0 510
30900C
30910C ELASTIC RANGE
30920 P=Y(1)+KE
30930 ZKLM=0.64
30940 VS1=0.04 $ VS2=0.21
3095 RETURN
30960C
30970C PLASTIC RANGE
30980 510 IF(Y(1).GT.YFAIL)G0T0 530
30990 ZKLM=7.0/12.0
31000 VSI=1.0/28.0 $ VSP=6.0/28.0
31010 IF(Y(1).GT.YT)G0T0 520
31020 0=0U
31030 RETURN
31040C
31050C TENSILE MEMBRANE RANGE
31060 520 0=0T+(Y(I)-YT)+(QFAIL-QT)/(YFAIL-YT)
31070 RETURN
310B0C
31090C FAILURE (SET RESISTANCE TO VERY SMALL VALUE)
31100 530 @=1E-11
31120C
           * PSI+,5X,+EC =+,F7.1,* KSI+,/,* FDY =+,F8.1,* PSI+,
31150+
31170+
           3x, +ES =+, F8.1, + KSI+,/, + LD ++, F6.1, + IN.
31191+
           * IN. *)
                                                                   (2)*,
31200 630 F@RMAT(/*REINF@RCEMENT VALUES*/* SECTION
                                                          AS
                              (P')+,8X,+D'+,/,8X,+(SQ IN-/FT)+,10X,
31210+
           9X,+D+,8X,+A'S
31220+ •(IN-) (SU IN-/FT)+10X+*(IN-)+)
31230 633 F@RMAT(/+QDL +++F6-2++ PSI YUL
                                            YUL =+, FR.2, + IN.+)
31240 640 FORMATCI5,F11.4,+ (+,F6.4,+)+,F9.3,F10.4,+ (+,F6.4,+)+,F9.3)
31250 650 FC (MATC/+LBAD-DEFLECTION CURVE++/+4X++G (PSI) Y (IN+)+)
31260 660 FORMAT(F9.2,F12.4)
31270 670 FORMAT(1H )
31300 695 FORMAT(/+0SHEAR #+>F9+2++ PSI++)
31310 706 FORMAT(/+INPUT CONTINUOUS REINFORCEMENT (SQ IN+/FT)+++)
31320 711 FORMAT (/*IS TENSILE MEMBRANE TO BE INCLUDED *.
           +(0=N8;1=YES)+,+)
31335 720 FORMAT(/*IS SHEAR FAILURE TO BE CONSIDERED*,
31338 957 F@RMAT(/+QSHR1 =+,F10-3,/,+QSHR2 =+,F10-3,/,+QSHR3 =+,F10-3)
31340 END
35000 SUBROUTINE MOMENT(FDC, FDY, ES, N, PV, B, AS, APS, D, DP, MU, ICR, IC)
35010C THIS SUBROUTINE DETERMINES THE ULTIMATE MOMENT CAPACITY AND 35020C CRACKED MOMENT OF INERTIA FOR REQUIRED SECTIONS
35040 REAL KI, K2, K3, KUD, N, IG, ICTOT, YU(4), ICR(4), AS(4), APS(4), D(4), DP(4)
35050C
35060C: DETERMINE VALUES OF CONCRETE PARAMETERS
35070 45 K1=0.94-FDC/26E3
35080 K2=0.50-FDC/8E4
35090 K3=(3900+0+0+35*FDC)/(3E3+0+82*FDC*FDC*FDC/26E3)
35100 EPSJ=0-004-FDC/65E5
```

```
351500: ••••••••••••••••••
35160Cs • DETERMINE ULTIMATE MOMENT CAPACITY AND CRACKED • 35170Cs • MOMENT OF INERTIA FOR REQUIRED SECTIONS •
35180C: ****************************
35190C
35200 II*03 ICT@T*0
35210 DØ 170 I=1.4
35215 MU(I)=0
35220 IF (AS(1).E0.0)G0T0 170
35230 11=11+1
35240C: ALL PROPERTIES ARE COMPUTED FOR A WIDTH B
35250 TENS#AS(1)#FDY#PV
35260 IF(APS(1)*LE+0)GBT0 150
35270C
35280C: WALL HAS COMPRESSION REINFORCEMENT
35290 C=K1+K3+FDC+B+DP(1)
35300 TERM1=0.5*(TEN5/APS(1)*ES*EPSC)
35310 TERM2=ES*EPSC*(TEN5-C)/APS(1)
35320C+ DETERMINE LOCATION OF NEUTRAL AXIS
35330 IF (TENS.LE.C) GOT# 140
35340C
35350C: KUD > D'
35360 FPS=TERM1+K3+FDC/2.0-SQRT((TERM1-K3+FDC/2.0)++2
35370+ -(TERM2+ES+EP3C+K3+FDC))
35380C: F'S MUST BE <= FDY
35390 IF(FPS+LT+FNY)68T8 130
35400 FPS+FDY
35410 130 TPS=AP$(1)+(FPS-K3+FDC)
35420 KUD=(TEN-TPS)/(K1+K3+FDC+B)
35430 MU(1)=(TENS-TPS)+(D(1)-K2+KUD)+TPS+(D(1)-DP(1))
35440 ICR(1)=BeKUD+93/3+0+N4AS(1)*(D(1)-KUD)**2
35450+ +(N-1)*APS(1)*(KUD-DP(1))**2
35460 GET# 152
35470C
35480C: YUD < D'
35490 140 FPS=-TERMI+SQRT(TERMI++2-TERM2)
35500C: F'S MUST BE 4= FDY
35510 IF(FPS.LT.FDY)G0T0 145
35520 FPS*FDY
35530 145 TERM3=TENS+APS(1)+FPS
35540 KUD=TERH3/(K1=K3+FDC+B)
35550 MU(1)=TERM3+(D(1)-K2+KUD)-APS(1)+FPS+(D(1)-DP(1))
35560 ICR(I)=B+KUD++3/3+N+AS(I)+(D(I)-KUD)++2+N+APS(;)+(DP(I)-KUD)++2
355 'O GOTO 152
35580C
35590C: WALL HAS NO COMPRESSION REINFORCEMENT
35600 150 KUD=TENS/(K1=K3+FDC+B)
35610 MU(1)=TENS+(D(1)-K2+KUD)
35620 ICR(1)=B+KUD++7/3+0+N+AS(1)+(D(1)-KUD)++2
35430C
35640 152 1CTOT=ICTOT+ICH(1)
35650 170 CONTINUE
35660C
35670C: DETERMINE AVERAGE CRACKED MOMENT OF INERTIA
35680 175 1C=1CT6T/11
35690 RETURN
35700 END
            SUBROUTINE RANDOM (IENTRY)
70000
70010C THIS SUBROUTINE INPU
                                  MEAN AND STANDARD DEVIATIONS FOR RANGEM
70020C VARIABLES; GENERATI
                                   INDEM VALUES! AND CONTROLS REQUIRED
70030C NUMBER OF CASES TO E
                                   NJ AND OUTPUTS FINAL RESULTS AND SUMMARY
70040C
70050 COMMON KINC.LDTYPE.KRF.KRAND.TIME.II.Y(100).Q.QU.YU.YFAIL.
70052+ ZLS, HS, FDY, AREA, ZHASS, ZKLM, VS1, VS2, PS0, PD0, PR, PEXT, PC, TC, TO, 70054+ P0, DELAY, S
70070 COMMON /SHEAR/ ISHEAR, JSHEAR, VSHEAR, MEMB
           COMMON /RAND/ TIMEC
70090 DIMENSION CH125(7), CH1975(7), TD1ST(7)
70100C
70110C VALUES FOR 97.5% (F=19,24,29,34,39,44,49)
            DATA CHIES/-4688,-5167,-5533,-5825,-6065,-6267,-6440/
DATA CHI975/1-7295,1-6402,1-5746,1-5284,1-4903,1-4591,1
70120
70130
70140
             DATA TDIST/2-093,2-064,2-045,2-032,2-022,2-016,2-010/
70150C
```

THE THE PARTY OF T

THE PARTY WAS ENDING THE PARTY OF THE

The second production of the second s

3

```
70160
            G218(5,50,70), IENTRY
          5 XDUMMY=XHORM1(-1.0,0.0.1.0)
70170
TOIEGC INITIALIZE RANDOM NUMBER GENERATOR
70190
            PRINT, /. . INPUT NRAND.
70200
            READ, NRAND
            DØ 47 I=1.NKAND
70210
            XDUMMY=XNORM1 (0.0,0.0,1.0)
70220
70230
         47 CONTINUE
            INDEX=0$ SPS@=0$ SSPLO=0
70240
70250
            ICHECK-20
70260C
        INPUT MEAN AND STANDARD DEVIATION FOR RANDOM VARIABLES IF (KRF. \pm0.0)G018 30
70270C
70275
            PRINT 67
7026C
            READ, SMEAN, SSD
70296
70410C
         KEINFORCED CONCRETE WALLS
70420 30 PRINT 86
70430 READ, FDYHEAN, FDYSD
            IF (KRF.EQ.1)PRINT 96
70440
            IF (KRF.EQ.O)PRINT 97
70445
70450
            RETURN
70460C
70470C
         GENERATE RANDOM VALUES
70570 50 FDT=XNBRM1(0.0.FDYMEAN.FDYSU)
70580
            IF (FDY.LE.O)GOTO 50
70585
             IF (KRF . LQ . 0) GOTO 65
70590
            S=XNORMI (0.0. SMEAN. SSD)
70600
             IF (S-LE-0) GOTO 60
70610
           INDEX=INDEX+1
70620
            RETURN
70630C SUM VALUES OF PSO AND PSO++2 FOR USE IN STATISTICAL ANALYSIS
70640 70 SPS##SPS#+PS#
70650
            SSPS0=SSPS0+PS0+PS0
70660C
70670C BUTPUT FINAL RESULTS
70730 76 IF(KRF.EQ.1)PRINT 92.FDY.S.PSQ.TIMEC 70735 IF(KRF.EQ.0)PRINT 90.FDY.PSQ.TIMEC
             IF: JSHEAR . EQ - 1 )PRINT 113
70737
             IF (JSHEAR . NE . 1 )PRINT 120
70738
            IF (INDEX-LT-ICHECK) RETURN
70740
       80
70750C
70760C DETERMINE MEAN, STANDARD DEVIATION, AND STANDARD ERROR FOR PSO
            ZNO=INDEX
70770
70780
            ZMEAN=SPSQ/ZNB
70790
            SD=SQRT((SSPS@-ZN@+ZMEAN+ZMEAN)/ZN@)
            STDERR-SD/(SQRT(ZNO-1))
70800
TOBIOC CHECK IF MAXIMUM 9F SO PSØ SAMPLES ØBTAINED
70820 IF(INDEX-EG-50)6010 62
70830C CHECK IF 95% CONFIDENCE INTERVAL FOR MEAN PSO VALUE IS
            1F(STDERK+TDIST((INDEX-15)/5)/ZHEAN-GT-0-10)GOTO 61
70840
70850C
70860C CONFIDENCE INTERVAL IS WITHIN 10% - DETERMINE UPPER LIMIT OF
70870C 95% CONFIDENCE INTERVAL FOR STANDARD DEVIATION
70880C PROBABILITY VALUE AND ITS 95% CONFIDENCE INTERVAL UPPER LIMIT 70890 62 SDU=SD/(SQRT(CH125((INDEX-15)/5)))
70900C CHECK IF MAXIMUM OF 50 PSO SAMPLES OBTAINED
70910 IF (INDEX-EG-50) GOTO 53
70920C CHECK IF UPPER VALUE OF 95% CONFIDENCE INTERVAL FOR STANDARD
70930C DEVIATION IS WITHIN 0.10 MEAN OF THE STANDARD DEVIATION
             1F(((SDU-SD)/ZMEAN).GT.0.10)G0T0 61
70950C
70960C 95% CONFIDENCE INTERVAL IS WITHIN 10% FOR BOTH MEAN AND 90% 70970C PROBABILITY VALUE -- THEREFORE SUFFICIENT SAMPLES OBTAINED
70980C DETERMINE 95% CONFIDENCE INTERVALS FOR MEAN, STANDARD DEVIATION
70990.
71000C AND 104 AND 70% PROBABILITE VALUES
71010
         53 ZMEANL=ZMEAN-STDERR+TDIST((INDEX-15)/5)
71020
            ZMEANU=ZMEAN+STDERR+TDIST((INDEX-15)/5)
71030
             SDL=SD/(SQRT(CHI975((INDEX-15)/5)))
            P10=ZMEAN-1-262+SD
71040
            PIOL=ZHEAN-1+282+SDU
71050
71060
            P10U-ZMEAN-1 - 282+5DL
71070
            P90=ZMEAN+1 -282+SD
71080
            P90L=ZMEAN+1 - 282+SDL
```

.

PROGRAM FLAT (CONCLUDED)

a very house and the heart particularity a

```
71090
              P90=ZMEAN+1-282+SD
71100
              F93U=ZMEAN+1+282+SDU
71110
              P90U=ZMEAN+1+262+SDU
71120C
71130C BUTPUT STATISTICAL PARAMETERS OF INCIPIENT COLLAPSE PRESSURE
71140
              PRINT 100, ZMEAN, ZMEAN' . ZMEANU, SD, SDL, SDU, P10, P10L, P10U,
71150+
                P90,P90L,P90U
71160
              PRINT 105, INDEX, STDERR
71170
              G016 999
71150C
71190C 95% CONFIDENCE INTERVAL IS NOT WITHIN 10% FOR BOTH MEAN AND 90
71200B
71210C VALUES -- THEREFURE OBTAIN 5 ADDITIONAL SAMPLES
71220
          61 ICHECK=ICHECK+5
71230
              RETURN
71240C
71270 86 FORMAT(/*INPUT MEAN AND STANDARD DEVIATION FOR FDY***) 71280 87 FORMAT(/*INPUT MEAN AND STANDARD DEVIATION FOR S***)
         90 FORMAT(F9-1-F10-2-F14-3-+)
71290
71310
         92 FORMAT(F9-1,F11-2,F10-2,F14-3,+)
71350
         96 F@RMAT(///.5x.*FDY*.9x.*S*.8x.*PS@*.6x.*C@LLAPSE TIME*)
71350 90 FORMAT(///-)3x3FDY-9X3-PS0-,4X3-CGULLAPSE TIME+)
71355 97 FORMAT(///-,4X3-FDY-9X3-PS0-,4X3-CGULLAPSE TIME+)
71360 100 FORMAT(//-)11X3-STATISTICAL PROPERTIES OF INCIPIENT PS0-,
71370+ //-39X3-95% CONFIDENCE LIMITS--/-,7X3-EILM-018X,
71380+ +VALUE LOWER UPPER--//-3 MEAN--F29-2,
                 •VALUE LOWER UPPER•,//, MEAN•,F29.2
2F12-2-//, STANDARD DEVIATION•,F15-2,2F12-2-//,
71390+
                 • 10% PROBABILITY VALUE • 3F12-2-//-
• 90% PROBABILITY VALUE • 3F12-2)
71#00+
71410+
71420 105 FORMAT(//,5X,*NUMBER OF OBSERVATIONS ),13,/,5X,
71430+ **STANDARD ERROR ***,F5.2)
71460 FUNCTION XNORMI (X,A,B)
71470 IF(X)10,20,20
71460 10 X0=RANF(-1-0)
71490 20 X1=RANF(0.0)
71500 X2=RANF(0-0)
71510 Y=SQRT(-2.0=ALØG(X1))+(C@S(6.283184+X2))
71520 XN#RM1+A+Y+B
71530 RETURN
71540 END
```

CONTRACTOR OF THE PROPERTY OF

The state of the state of the sold of the state of the st

;

REFERENCES

- Wichle, C. K., and J. L. Bockholt, "Existing Structures Evaluation, Part I: Walls" (for Office of Civil Defense), Stanford Research Institute, Menlo Park, California (November 1968) AD-687 293.
- Iverson, J. H., "Existing Structures Evaluation, Part II: Window Glass and Applications" (for Office of Civil Defense), Stanford Research Institute, Menlo Park, California (December 1968) AD-687 294.
- 3. Jensen, G. F., "Existing Structures Evaluation, Part III: Structural Steel Connections" (for Office of Civil Defense). Stanford Research Institute, Menlo Park, California (December 1969) AD-701 088.

THE CONTROL OF THE PROPERTY OF

- 4. Wiehle, C. K., and J. L. Bockholt, "Existing Structures Evaluation, Fart IV: Two-Way Action Walls" (for Office of Civil Defense), Stanford Research Institute, Menlo Park, California (September 1970) AD-719 306.
- 5. Wiehle, C. K., and J. L. Bockholt, "Existing Structures Evaluation, Part V: Applications" (for Office of Civil Defense), Stanford Research Institute, Menlo Park, California (July 1971) AD-733 343.
- 6. Wiehle, C. K., and J. L. Bockholt, "Blast Response of Five NFSS Buildings" (for Office of Civil Defense), Stanford Research Institute, Menlo Park, California (October 1971) AD-738 547.
- 7. Wiehle, C. K. and J. L. Bockholt, "Dynamic Analysis of Reinforced Concrete Floor Systems" (for Defense Civil Preparedness Agency), Stanford Research Institute, Menlo Park, California (May 1973) AD-768 336.
- 8. Wiehle, C. K., "Dynamic Analysis of a Building and Building Elements" (for Defense Civil Preparedness Agency), Stanford Research Institute, Menlo Park, California (April 1974), AD-A001 387.
- 9. Newmark, N. M., "A Method of Computation for Structural Dynamics," ASCE Transactions, Paper No. 3384, Vol. 127, Part I (1962).

- 10. "The Effects of Nuclear Wessions," Glasstone, S., ed., Department of Defense and Atomic Energy Commission, Washington, D.C. (February 1964).
- 11. "Weapons Effects Data," EM 1110-345-413, The Design of Structures to Resist the Effects of Atomic Weapons, Massachusetts Institute of Technology for the Office of Chief of Engineers, U.S. Army, Washington, D.C. (July 1959).
- 12. Rempei, J. R. "Room Filling From Air Blast," Appendix E of Technical Report by H. L. Murphy and J. E. Beck, Slanting for Combined Nuclear Effects: Examples with Estimates, and Air Blast Room Filling, Stanford Research Institute (For Defense Civil Preparedness Agency), Menlo Park, California (June 1973) AD-783-061.
- 13. Tolman, D. F., R. O. Lyday, and E. L. Hill, "Statistical Classification Report, Estimated Characteristics of NFSS Inventory" (for Defense Civil Preparedness A_cency), Research Triangle Institute, Research Triangle Park, North Carolina (December 1973).
- 11. T. Y. Lin & Associates, "A Computer Program to Analyze the Dynamic Response of High Rise Buildings to Nuclear Blast Loading," Vols. I and II, PG 80-18-1 & 2, Office of Civil Defense, Washington, D.C. (February 1964).
- 15. <u>Building Exits Code</u>, No. 101, National Fire Protection Association, Boston, Massachusetts (1963).
- 16. Building Code Requirements for Reinforced Concrete, ACI 318-63, American Concrete Institute, Detroit Michigan (June 1963).

NOMENCLATURE

Area of concrete section, sq in.	Arco	οt	concrete	sect	ion.	SO	in.
----------------------------------	------	----	----------	------	------	----	-----

Area of cension steel in reinforced concrete slab per unit width, sq in./in.

Area of window, sq ft

Width of cross section, in.

Width of wall between edge of door opening and areaway support wall, in.

Distance from compressive face of reinlorced concrete slab to centroid of tension steel, in.

Compressive strength of 6- by 12-in. concrete cylinder, psi

Dynamic compressive strength of concrete, psi

Dynamic yield strength of reinforcing steel, psi

Ultimate compressive strength of masonry unit wall, psi

Modulus of rupture, psi

Static yield strength of reinforcing steel, psi

Soil depth, ft

Lateral soil coefficient

Span length, in.

Horizontal length (width) of wall, in.

Vertical length (height) of wall, in.

Bending moment per unit width, in.-1b/in.

Ultimate moment capacity per unit width, in.-1b/in.

Steel ratio, tension steel

t) Unit pressure exerted against any surlace varying with time, psi

- ph Lateral static soil pressure, psf
- p. Reflected overpressure, psi
- p, Penk incident overpressure, psi
- P_T Total lateral load acting on wall, 1b
- P_{ν} Total vertical force per unit width, lb/in.
- q Unit resistance for uniformly loaded member, psi
- S Clearing distance, ft
- t, Clearing time, front face, sec
- t_o Duration of positive overpressure, sec
- t, Thickness of wall, in.
- V Total shear per unit width, 1b/in.
- (V_c), Total shear capacity per unit width at support, 1b/in.
- (v_c), Unit shear capacity per unit width at support, psi
- W Weapon yield
- Y Unit weight, pcf
- O Unit weight of soil, pcf
- φ Coefficient of flexure